

2016

Participation in Active and Passive Music Interventions by Individuals with Alzheimer's Disease and Related Dementias: Effects on Agitation

Robert J. Prattini

Louisiana State University and Agricultural and Mechanical College, rpratt3@lsu.edu

Follow this and additional works at: https://digitalcommons.lsu.edu/gradschool_dissertations



Part of the [Social Work Commons](#)

Recommended Citation

Prattini, Robert J., "Participation in Active and Passive Music Interventions by Individuals with Alzheimer's Disease and Related Dementias: Effects on Agitation" (2016). *LSU Doctoral Dissertations*. 4445.
https://digitalcommons.lsu.edu/gradschool_dissertations/4445

This Dissertation is brought to you for free and open access by the Graduate School at LSU Digital Commons. It has been accepted for inclusion in LSU Doctoral Dissertations by an authorized graduate school editor of LSU Digital Commons. For more information, please contact gradetd@lsu.edu.

PARTICIPATION IN ACTIVE AND PASSIVE MUSIC INTERVENTIONS BY
INDIVIDUALS WITH ALZHEIMER'S DISEASE AND RELATED DEMENTIAS: EFFECTS
ON AGITATION

A Dissertation

To be submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The School of Social Work

by

Robert J. Prattini

B.S., Louisiana State University, 2001

M.A., Louisiana State University, 2006

M.S.W., Louisiana State University, 2009

December 2016

ACKNOWLEDGEMENTS

I am grateful to many people for their help and support towards me accomplishing this major goal in my life. I would not be where I am today without their incredible encouragement and guidance over the past several years.

First, I would like to express considerable gratitude to my dissertation committee chair, Tim Page. I have benefited significantly from your continuing mentoring and dedication to my research. I am privileged to have worked closely with you on this project, and could not have seen it through from conception to completion without your help. Next, I would like to acknowledge my other committee members, both past and current. Daphne Cain, my former co-chair, also helped me realize my ideas into a feasible project, and Scott Wilks, current committee member, who encouraged me to continue with my research in gerontology. Loren Marks, former committee member, I thank you for helping me prioritize the most important aspects of my project, and Lilly Allen, thank you for your support as my latest committee member.

I am also grateful toward the staff at Alzheimer's Services of Baton Rouge who allowed me to collect my data at their daytime respite center and provided me with needed resources to complete my study. Thank you Barbara Auten, Dana Territo, Tina Durham, Ed Picard, and Marcia Kirk for all your help and support at the research site.

I would also like to extend my appreciation and gratitude to my family. To my parents and my wife for being supportive and understanding, and for your continuing encouragement to work towards my goals, I thank you. I would also like to extend further appreciation to my wife for helping me throughout this project. Next, I would like to acknowledge my two dogs who provided me much needed stress relief. Lastly, I would like to acknowledge my friends and colleagues that let me run ideas past them and were supportive and encouraging throughout my time in graduate school. I am honored to have such great people and beings in my life.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS.....	ii
ABSTRACT.....	vi
CHAPTER	
1 INTRODUCTION.....	1
Prevalence and Scope of Alzheimer’s Disease.....	2
Younger-Onset Alzheimer’s Disease.....	3
Societal and Individual Effects of Alzheimer’s Disease.....	4
Agitation in Alzheimer’s Disease.....	5
Treatment of Alzheimer’s Disease.....	6
Purpose and Conceptual Framework.....	6
Planned Contributions of the Proposed Research.....	8
Conclusion.....	10
2 CONCEPTUALIZATION OF ALZHEIMER’S DISEASE.....	14
History of Alzheimer’s Disease.....	14
Risk Factors for Alzheimer’s Disease.....	22
Characteristics of Alzheimer’s Disease.....	35
Symptomology of Alzheimer’s Disease.....	35
Proposed Changes to Criteria for Alzheimer’s Disease.....	42
Diagnostic Criteria for Alzheimer’s Disease.....	43
Treatment of Alzheimer’s Disease.....	48
Caregiving.....	48
Medications.....	54
Psychosocial Interventions.....	55
Policy Responses to Alzheimer’s Disease Treatment.....	57
Summary.....	61
3 THEORIES OF MUSIC’S EFFECTS ON EMOTION AND BEHAVIOR.....	63
Evolution of Music.....	63

	Music as Communication.....	64
	Music and Emotion.....	66
	Cognitive Processing of Emotions.....	67
	Biophysiological Effects of Music.....	68
	Psychosocial Theories for Music’s Effects on Emotion.....	71
	Music and Memory.....	74
	Music and Stress Threshold in Alzheimer’s Disease.....	78
	Conclusion.....	79
4	REVIEW OF MUSIC THERAPY LITERATURE.....	81
	Conceptualization of Music Therapy.....	82
	Active Music Therapy.....	82
	Passive Music Therapy.....	84
	Individualized Music.....	85
	Applications of Music Therapy.....	87
	Music Interventions for Alzheimer’s Disease.....	89
	Research Utilizing Music Interventions for Agitation in Alzheimer’s Disease.....	92
	Limitations of Prior Research.....	106
	Summary.....	113
5	METHODOLOGY.....	114
	Characteristics of the Respite Center.....	115
	Characteristics of Clientele.....	117
	Participants in the Study.....	118
	Measurements.....	119
	Demographics.....	119
	Cognitive Impairment and Stage of Alzheimer’s Disease	120
	Agitation.....	123
	Participation in Music Therapy	128
	Research Design and Procedure.....	129
	Institutional Review Board Review and Approval.....	129
	Participant Informed Consent.....	130
	Research Design and Procedure.....	130

	Observer Training and Reliability.....	133
	Data Analysis.....	134
	Power Analysis.....	134
	Descriptive Statistics.....	135
	Inferential Statistics.....	135
6	RESULTS.....	138
	Demographic and Descriptive Data.....	138
	Inferential Statistics.....	145
	Meta-Analysis.....	148
7	DISCUSSION.....	166
	Results of Hypotheses.....	166
	Strengths and Limitations.....	173
	Implications.....	178
	Conclusion.....	185
	REFERENCES.....	189
	APPENDICES	
	A: COHEN MANSFIELD AGITATION INVENTORY.....	197
	B: RICHMOND AGITATION-SEDATION SCALE.....	198
	C. INSTITUTIONAL REVIEW BOARD APPROVAL.....	199
	VITA.....	200

ABSTRACT

The ability of music to produce calming effects on us is well documented, and its use is becoming an increasingly accepted intervention with populations displaying agitated and disruptive behaviors, such as people with Alzheimer's disease (AD) or other dementias. One reason for its widespread use is because research has demonstrated music's efficacy in reducing agitation, and consequently disruptive behaviors, in those with AD. Prior studies on music's effects on agitation in older people with AD have utilized either recorded music used passively, or active sessions with a music therapist or musicians, but none have compared the effects of each type of intervention. The purpose of the current study is to examine music's effects on levels of agitation in people with AD or other dementias. The research design is quasi-experimental, utilizing a convenience sample of people with AD who live at home and are cared for by an informal caregiver. The current study is unique in several ways. First, past studies of music interventions with people with AD and related dementias have used either passive or active interventions, but have not compared the effects of both as the current study attempts to do. Next, past studies of music therapy with people with dementia have not examined how participation during the music sessions affects agitated behaviors. Past studies have demonstrated variations in participants' responses to music therapy and activities, and this may be due to whether or not the participant is actually engaged with the intervention. This study assesses engagement by including participation as a variable. Lastly, the current study utilizes a unique sample of people with AD and related dementias who will continue to live at home during the course of the study.

CHAPTER 1: INTRODUCTION

A famous proverb states that “music has charms to soothe a savage breast” (note: often misquoted as “beast”; Congreve, 1697). Music’s use as a tool for physical relaxation and emotional regulation dates back to ancient times, and is even mentioned in the bible when David plays the lyre (i.e., a small harp) for King Saul and he is “relieved and feels better” (online bible, www.bible.com). Mounting evidence in social science research of how music has a calming effect on us has demonstrated music’s poignant effects (Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, Rhone, Backhaus, & Shaver, 2008), and actual neuro-physiological changes have been confirmed in neuroscience research as well (Andrade & Bhattacharya, 2003; Sacks, 2008). The ability of music to produce calming effects on us is well documented, and its use is becoming an increasingly accepted intervention with populations displaying agitated and disruptive behaviors, such as people with Alzheimer’s disease (AD) or other similar dementias (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008), and children with autism spectrum disorders (Gold & Wigram, 2007; Whipple, 2004). Beyond having a soothing effect, the use of music has also been implicated in pain control (Kneafsy, 1997), improving verbal communication (Gotell, Brown, & Ekman, 2009), and enhancing cognitive abilities, such as short-term memory (Baker, 2001; Carruth, 1997), in a variety of populations, including people with AD.

Music therapy, music activities, and the use of recorded music are becoming progressively acknowledged methods for intervening with the agitation and disruptive behaviors associated with AD, and are also considered a good source of cognitive stimulation for those suffering (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sacks, 2008; Sung & Chang, 2005; Witzke, et al., 2008). Music’s utility as an emotional regulator and a source of cognitive

stimulation has been demonstrated in many prior studies, and reducing negative emotions such as anxiety and stimulating cognition such as memory, can increase the quality of life of people suffering from AD (for a thorough review of literature, see Chapter 4). One reason for its widespread use is because research has demonstrated music's efficacy in reducing agitation, and consequently disruptive behaviors, in those with AD, and because the use of music as an intervention can be relatively easy to implement (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008).

Music interventions can be as simple and straightforward as playing recorded music to AD sufferers (i.e., a passive music intervention) (e.g., Sung & Chang, 2005; Witzke, et al., 2008), although singing and/or playing simple instruments in a group and/or individual setting with a music therapist (i.e., an active music intervention) has also been shown to be effective in treating the agitated symptoms of AD (e.g., Gardiner & Furois, 2000; Ledger & Baker, 2007). Prior studies on music's effects on agitation in people with AD have utilized either recorded music used passively (Sung & Chang, 2005; Gerdner, 1997, 2001), or active sessions with a music therapist or musicians (Gardiner & Furois, 2000; Ledger & Baker, 2007), but none have compared the effects of each type of music intervention. Reducing agitation in people with AD may not reduce instances or slow the progression of the disease- which is far beyond the scope of this research- but it may improve the quality of life of both AD sufferers and those around them.

Prevalence and Scope of Alzheimer's Disease

There are an estimated 36 million adults worldwide who are currently living with AD or other similar types of dementia (Alzheimer's Association, 2011), with 5.4 million of those instances occurring within America (Alzheimer's Association, 2012). The number of AD diagnoses is continually increasing, as much as one new diagnosis every 68 seconds, making AD

the most prevalent type of dementia found in older adults worldwide (Alzheimer's Association, 2011; Hayslip, Han, & Anderson, 2008; Parks & Novelli, 2005; Richter & Richter, 2004). The 2000 U.S. Census data estimated that there are 73,000 people in Louisiana alone living with Alzheimer's disease, and this is projected to increase by 14% to 83,000 in the 2010 census (Alzheimer's Association, 2012; Herbert & Scherr, 2003). This is projected to continue to increase up to 100,000 by 2025 (Alzheimer's Association, 2012). This projected increase is largely due to the rising average age of the population. Once older adults reach the age of 65 and beyond, both normal and abnormal age-related cognitive decline, and also the risk of developing senile dementia including AD, continue to increase (Richter & Richter, 2004; U.S. Department of Health and Human Services, 2011). Alzheimer's Association (2012) estimates that 11% of men and 16% of women aged 71 and over have some form of dementia, and almost half (45%) of people over the age of 85 have AD (Alzheimer's Association, 2012). While advancing age has the biggest influence on developing AD, it can also occur in people under the age of 65.

Younger-Onset Alzheimer's Disease

AD is commonly thought of as a disease affecting those older than 65 years of age, although younger-onset Alzheimer's disease (YOAD), which occurs in people younger than the age of 65, also affects a significant number of people (Alzheimer's Association, 2012). A large, national survey of people age 50 and older in the U.S. estimated that 480,000 people age 55-64 had some form of cognitive impairment severe enough to be considered disabling (Ofstedal, McAuley & Herzog, 2002). Disabling cognitive impairment in this study was at a level equivalent to a dementia diagnosis; that is, it was severe enough to significantly interfere with daily activities. Using this and other survey data, the Alzheimer's Association (2011) estimated that there are approximately 500,000 people in the U.S. under age 65 with some form of

dementia, with approximately 200,000 people specifically having YOAD. YOAD and other younger-onset dementias usually progress much more rapidly than dementias found in people over age 65, making them an even greater concern. In addition, 6-10% of people over age 65 diagnosed with dementia were reported to have had symptoms that appeared before age 65, with onset sometimes as young as age 40 (Alzheimer's Association, 2006). The pervasive effects of AD, particularly in instances of YOAD, continue to increase AD's cost to society.

Societal and Individual Effects of Alzheimer's Disease

The high frequency of AD in the population has devastating costs to not only those afflicted and their close relatives and caregivers, but also to society as a whole. Numerous economic studies have shown that AD costs American businesses and Medicare and Medicaid billions of dollars annually, with the current, national annual cost estimated at \$172 billion and worldwide cost at \$604 billion USD (Alzheimer's Association, 2011). This current cost is nearly triple what it was only 10 years ago, and this cost to society is projected to continue rising steadily (Alzheimer's Association, 2011). Several factors add to the expenditure of AD in America. Some of these are increasing direct healthcare and nursing home costs, increases in Medicare and Medicaid reimbursements for services, and impacts on caregivers' and care recipients' employment, such as missed work and lost productivity (Alzheimer's Association, 2012; Scott, Roberto, Hutton, & Slack, 1985).

AD and other dementia caregivers also struggle with the enormous burden associated with meeting the daily needs of those with the disease, and particularly with watching the progressive, functional decline of a loved one (Alzheimer's Association, 2012; Vitaliano, Zhang, & Scanlan, 2003). Some services offered by both national and local dementia-focused programs are specifically designed to decrease caregiver burden, including respite care, psychoeducation

and training, and support groups for caregivers (Alzheimer's Association and National Alliance for Caregiving, 2004; Vitaliano, et al., 2003). Respite programs provide temporary relief from caregivers' duties while also providing direct care to the clients with AD and other dementias. Respite programs often include cognitively-stimulating activities and social interventions that are offered to the clients who attend. Among these may be arts and crafts, gardening, light physical exercise, storytelling, cooking classes, game playing, and music and pet therapy that may help assuage agitation and other symptoms in clients with dementias.

Agitation in Alzheimer's Disease

One hallmark of AD as it progresses is increasing levels of agitation (Gardiner & Furois, 2000; Ledger & Baker, 2007; Richter & Richter, 2004; Sung & Chang, 2005; Witzke et al., 2008). Agitation often results from feelings of frustration commonly experienced by the AD sufferer of not being able to function, either cognitively or physically, or be able to express oneself, as well as one once has before acquiring the disease (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008). These feelings of frustration can often lead to agitated and aggressive, sometimes disruptive behaviors if nothing is done by caregivers or others to intervene (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008).

Additionally, agitation and the resultant behaviors in AD sufferers are frequently reported by caregivers to be the most challenging aspect of their duties (Sung & Chang, 2005; Witzke, et al., 2008). The presence of agitation in people with AD and related dementias adds burden onto their caregivers and can also negatively influence the caregivers' perceptions toward the care recipients (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008). Reducing the agitation associated with AD and the related behaviors in people with AD

can improve the quality of life of both AD sufferers and those around them, including their close family and other relatives, who are often also their caregivers. Many psychosocial interventions are known to have calming effects, including the use of music, and can be utilized by both professional and informal caregivers, social workers, and others who work with people with AD and other forms of dementia, along with medical treatment, for this application.

Treatment of Alzheimer's Disease

Treatment of AD with the use of medications is becoming increasingly common; however, because of the limited focus of only mildly enhancing cognitive and sometimes also physical functioning, it is important to consider all possible interventions that are available. Because of the well-known limited efficacy in treating AD using the currently available medications, many psychosocial interventions that provide cognitive stimulation or social engagement are usually also a part of treatment regimens. While there is no treatment that can completely ameliorate the disease, it is becoming increasingly clear that there are many methods, including psychosocial interventions such as music therapy and other interventions involving music, which when used together, may help to temporarily prevent or at least slow the worsening of some of its symptoms once AD has appeared. Individualized, multidisciplinary treatment regimens, including psychosocial interventions that provide cognitive stimulation and social support such as group music interventions provide, and also medications when necessary, appear to be the best treatments available for AD at this time.

Purpose and Conceptual Framework

The purpose of the current research study is to examine music's effects on levels of agitation in people with AD. The research design utilized is a quasi-experimental design using a convenience sample of people with AD who live at home and are cared for by an informal

caregiver (e.g., family member or friend). There were two levels of music intervention (the primary independent variable) used while assessing agitation levels (the dependent variable). The levels of intervention were *active*, in which a musician performed live and encouraged singing along, and *passive*, in which recorded music consisting of popular songs from the 1940's through the 1960's or other music were played for participants. The design of this study is based on testing the following hypotheses:

Hypothesis 1: The level of music intervention (e.g., passive and active) will influence agitation differently in people with AD;

Hypothesis 2: Agitation is expected to be reduced during the intervention when compared to baseline measurements;

Hypothesis 3: Greater participation (e.g., if participants sing or clap rather than simply listen) will result in greater reductions of agitation whether the intervention is active or passive;

Hypothesis 4: The active form of music intervention in which participation is encouraged will result in greater reductions in agitation than the passive form.

That is, it is expected that the active intervention will lead to greater participation in music therapy, and thus greater reduction in agitation in people with AD and related dementias. During the passive intervention prerecorded music will simply be played for participants without encouraging singing; however, participation will still be measured since participants may also sing along or participate by moving in rhythm to the recorded music (e.g., tapping foot, clapping).

Few prior studies of music's effects on agitation in people with AD and related dementias have been conducted using a true experimental design, where a large random sample was

randomly assigned to treatment or matched conditions, to this author's knowledge. This is likely due to feasibility issues of such a study. Therefore, like research in almost any field using human participants, the research on music's effects in people with AD suffers from the various threats to both internal and external validity, including many confounding variables that also influence agitation in people with AD. The current study, while not adhering to the "gold standard" of a true experimental design, utilized strong research methodology which helped control for some of these various confounds, and will therefore contribute original knowledge to the field.

Planned Contributions of the Current Study

The current study of music's effects on agitation in people with AD is unique in several ways. First, past studies of music interventions with people with AD and related dementias have used either passive or active interventions, but have not compared the effects of both. Since this study compares both types, it may provide evidence of what type of intervention is most efficacious and allow for those implementing music interventions for people with AD to utilize best practices. Next, past studies of music therapy with people with AD have not examined participation during the music sessions. Past studies have demonstrated variations in participants' responses to music therapy and activities, and this may be due to whether or not the participant is actually engaged with the intervention. Participants with AD and related dementias may be less responsive during music sessions for a variety of reasons, such as tiredness, hunger, not enjoying music, or numerous other factors, all of which could not be assessed in any feasible study. While the countless factors influencing participation in music sessions could not be realistically assessed, actual participation can be assessed relatively easily. No prior studies have examined participation as a variable affecting the outcome of music sessions in people with AD to this author's knowledge. Examining participant engagement could provide insight into the best

methods of engaging clients in music interventions, and therefore help them get the most out of the sessions.

Lastly, most prior studies on music's effects on agitation in people with AD have been done with residents in assisted-living facilities, such as nursing homes (e.g., Ledger & Baker, 2007). While residents of these facilities are provided with a more structured environment, they are usually exposed to multiple treatment interventions and activities throughout the day, which may make it difficult to separate the effects of music from other treatments included in participants' regimens. Only one small, pilot study has been done on music therapy's effects on people with AD who live at home and are cared for by a family member; however, this study required that participants all stay together with their caregivers in a residential facility during the course of the study, which may have affected the outcome (Gerdner, 2005). People with AD and related dementias who do not live in assisted-living facilities encompass a large proportion of the population of people with AD. Studying music's effects in this population will help further the generalizability of music interventions and may provide informal caregivers a potential method of reducing agitation in their care recipients that they could implement at home. The current study utilized a sample of people with AD and related dementias who continued to live at home during the course of the study, and had already been receiving weekly music sessions at a respite center. Therefore, this study did not manipulate participants' daily routines, allowing for naturalistic observations of the effects of participation in music activities in a unique sample of people with AD living at home.

This research utilized a quasi-experimental design that was intended to study music's effect of decreasing agitation in people with AD. Agitation in participants with AD in this design was measured by the Cohen-Mansfield Agitation Inventory (CMAI; Cohen-Mansfield, 1997)

and the Richmond Agitation-Sedation Scale (RASS, Sessler, et al., 2002). Music therapy interventions that were used include both active participation in live music sessions through singing, clapping, and other movements to popular songs, and passive listening to prerecorded music. These were compared to baseline measures during times when music was not played, but participants were assessed for agitation levels. Agitation levels were assessed on a weekly basis both before and after the music interventions were implemented in order to demonstrate the changes resulting from them. Although the study lasted for 10 weeks, no long-term effects were expected due to a lack of long-term effects in prior research (Ledger & Baker, 2007). The length of the study adds weight to the findings through replication of assessments each week. Reduced agitation during music interventions as compared to assessment times without music was anticipated.

Conclusion

The use of music interventions to reduce agitation and improve wellbeing among individuals with AD and related dementias has been demonstrated in many prior studies (e.g., Baker, 2001; Brotons & Marti, 2003; Gerdner, 2001, 2005; Gotell, Brown, & Ekman, 2009; Hicks-Moore, 2005; Janata, 2012; Ledger & Baker, 2007; Sung & Chang, 2005). However, the majority of these studies had methodological limitations that possibly affected both the internal and external validity of the findings. The current study focused on music therapy and musical activities and their utility in treating agitation associated with Alzheimer's disease (AD) and related dementias. Both active and passive forms of music therapy were utilized and compared, and participation and engagement with the intervention were also measured. The study also included a unique population of people with dementia who remained living at home during the course of the study. Music's beneficial effects on cognition and behavior are examined in people

with Alzheimer's disease and related dementias and also other populations through a thorough review of literature in this area. The efficacy of music to reduce agitation and disruptive behaviors associated with AD and related dementias are given extra emphasis since this is the primary area of interest for the current study.

Chapter 2 thoroughly explores and discusses many aspects of AD, including the use of psychosocial interventions such as music therapy in treatment. AD is known to affect not only cognitive functioning, but physical and social functioning as well. Psychosocial interventions such as music therapy are often used in conjunction with other treatment methods to help ameliorate agitation and other symptoms associated with the disease. This chapter will discuss the history, prevalence, risk and protective factors, symptoms of cognitive and physical dysfunction, criteria and stages for diagnosis, and available treatments associated with the most common type of dementia —AD— found in older adults.

Next, chapter 3 examines possible underlying theoretical mechanisms for music's soothing effects in both normal and diseased populations, including people with AD. The effects of music discussed include both biological and neurological changes in listeners along with the subjective experiences of lowering stress and anxiety based on self-report in listeners. Music as a means of communicating emotions and its evolution as a primary method of communication are discussed with a focus on communication and regulation of emotions, particularly for stress and anxiety release. Music's link to and effects on autobiographical memory are also examined since specific pieces of music are often associated with significant life events. While the exact underlying mechanism for music's ameliorating effect on agitation in people with AD may not be known, several possible theories can be applied to help further understand this phenomenon.

This chapter concludes with a discussion of relevant theories to the use of music for treating the symptoms of AD.

Chapter 4 conceptualizes music therapy by exploring various definitions, including the methods and techniques that are commonly used in treatment. Next, this chapter explores different types of music therapy, and discusses the potential benefits and any possible negative effects associated with it, in a variety of populations. Consequently, applications of music therapy to other disorders besides AD are briefly discussed in order to demonstrate music therapy's broad utility. A thorough review of the literature regarding the treatment of agitation with music in people with AD, and the limitations of this research, including internal and external validity issues concludes Chapter 4. Reducing agitation can improve the quality of life of both dementia sufferers and those around them, including their caregivers and their close family and other relatives and loved ones. Agitation levels were mostly reduced after receiving either active or passive types of music interventions in the research examined in this chapter, demonstrating the efficacy of music therapy and other music interventions for people with dementia.

Prior studies on music's effects on agitation in people with AD, however, have utilized either recorded music used passively (Sung & Chang, 2005; Witzke, et al., 2008), or active sessions with live music (Gardiner & Furois, 2000; Ledger & Baker, 2007), but have not compared both. The current study outlined in Chapter 5 focuses on comparing the effects of both active and passive music interventions in order to determine which has greater effects on agitation levels in people with AD. Further research in this area may not only help reveal the beneficial influences of music therapy on individuals with AD, but could also improve multidisciplinary treatment regimens for AD sufferers, AD treatment efficacy, and the overall

wellbeing of individuals with AD and their caregivers. The current study utilized a quasi-experimental design based on Gerdner's (1997) theoretical model for music's effect of reducing agitation in people with AD.

CHAPTER 2: CONCEPTUALIZATION OF ALZHEIMER'S DISEASE

Alzheimer's disease (AD) has not only captured the attention of older adults who are concerned about developing it, but also that of gerontology researchers worldwide. This is partly because of the increasing life expectancy of persons living today and the consequential diseases related to aging such as AD (Alzheimer's Association, 2012). Medical advances are now allowing life spans that reach beyond a hundred years, something that was virtually unheard of just a short time ago. Because of the increasing number of older adults in the world, there is a growing concern of preserving their functioning late in life. Older adults want to have the physical and mental capacity to fully participate in the expanding number of years left in their lives and also preserve their wisdom and memories of experiences they have already had. Consequently, there has been a dramatic increase in published research on AD within the last two decades. Advances in science have demonstrated that it is not inevitable to completely lose your cognitive functional capacity, including memory, concentration, and problem solving ability, with advancing age. However, once older adults reach their mid-seventies, the magnitude of age-related cognitive decline and the risk of developing senile dementia significantly increase (Richter & Richter, 2004; U.S. Department of Health and Human Services, 2011). AD is known to affect not only cognitive functioning, but physical and social functioning as well. This chapter will discuss the history, prevalence, risk factors, diagnosis and cognitive dysfunction associated with AD, the most common type of dementia found in older adults.

History of Alzheimer's Disease

Alzheimer's disease (AD) is named after Alois Alzheimer, who is frequently credited for discovering the disease early in the 20th century (Berrios, 1990; Maurer, Yolk, & Gerbaldo, 1997). However, age-related cognitive decline, which has many potential causes, has been

recognized throughout history (Berrios, 1990). Furthermore, the association between brain pathology and mental functioning in the elderly was clearly identified decades before Alzheimer put a specific name to the disease (Mandell & Green, 2011). However, senile dementia was the general clinical term used for age-related cognitive decline and no distinctions of different causes for dementia were typically made at that time (Berrios, 1990). Alzheimer, however, was the first to keep a detailed account of an instance of AD with the case of Auguste D. (Maurer, Yolk, & Gerbaldo, 1997).

Alzheimer was confronted with Auguste D.'s case in 1901, with symptomology of “a sudden change in her behavior, dominated by panic, terror, and suspicions of [the husband] having an affair with the neighbor” and “weakening of memory, persecution mania, sleeplessness, restlessness... rarely free of fear and agitation” (p. 3, Mandell & Green, 2011). Auguste D. was hospitalized and never released because of the severity of her symptoms. This allowed Alzheimer to work with Auguste D. closely, and after her death Alzheimer was allowed to examine her brain and note the physical changes that he found (Maurer, Yolk, & Gerbaldo, 1997). While dementia was already a term in clinical use at this time, Alzheimer distinguished AD with the physical changes in the brain he had found in Auguste D. (Maurer, Yolk, & Gerbaldo, 1997). Alzheimer presented his case in a 1907 article describing what he had found as possible underlying causes for the disease. These changes included the recognition of plaques and tangles within the brain that are still considered primary aspects of AD today (Mandell & Green, 2011; Maurer, Yolk, & Gerbaldo, 1997).

The earliest instance of use of the diagnosis of AD, besides by Alzheimer himself, was in 1908 (Maurer, Yolk, & Gerbaldo, 1997). AD became regularly used as a diagnosis at this time, and for the next 50 years, for instances of “presenile dementia” in order to distinguish it from

what was considered normal “senile dementia” (p. 4, Mandell & Green, 2011). Senile dementia was considered a normal, inevitable part of aging at the time (Berrios, 1990). Alzheimer, however, noted that AD was not a precursor to senile dementia by pointing out that there were not significant differences in AD cases based on age (Maurer, Yolk, & Gerbaldo, 1997). Nonetheless, senile dementia remained thought of as a normal aspect of the aging process late into the 1940’s, with AD thought of as a precursor (Maurer, Yolk, & Gerbaldo, 1997; National Institute on Aging & National Institutes of Health, 2011).

It wasn’t until the 1950’s that scientists began to examine the structures of the plaques and tangles associated with AD (National Institute on Aging & National Institutes of Health, 2011). In the 1960’s when a strong association could be made between the plaques and tangles within the brain and having dementia, AD became accepted as a separate entity from senile dementia, and not a normal part of aging (Mandell & Green, 2011; Maurer, Yolk, & Gerbaldo, 1997). Plaques and tangles have continued to be researched, and are discussed further under the “Characteristics of Alzheimer’s Disease” section in this chapter.

The 1970’s led to discoveries of other biomarkers of AD, including low levels of the neurotransmitter acetylcholine (Ach; National Institute on Aging & National Institutes of Health, 2011). Ach is the primary neurotransmitter associated with learning and memory within the brain, and most of the drugs available today for treating AD are Ach agonists (i.e., boost Ach; Alzheimer’s Association, 2012). It has been demonstrated consistently in prior research that persons with AD show severe deficits of Ach, and drugs that boost Ach have proven useful for slowing the progression of some symptoms of the disease (Alzheimer’s Association, 2012; Richter & Richter, 2004). These drugs, however, have proven to have limited utility in treating

AD, so other underlying mechanisms for AD were still suspected, including a genetic connection.

Genetic links for acquiring younger-onset AD were beginning to surface in the 1980's (National Institute on Aging & National Institutes of Health, 2011). However, genetic coding was in its infancy at this time, therefore no robust associations could be made for genetic causes for most instances of AD (Alzheimer's Association, 2012). Even today when one can be more easily tested for carrying the suspected genes, in most cases genetics only play a small role in the risk of acquiring AD (Alzheimer's Association, 2012). Research has shown that even for people with a strong family history of younger-onset AD, only roughly 50 percent of cases are related to a known genetic defect, and that about 75 percent of all types of AD are classified as sporadic, occurring in individuals from families with no history of the disease (Alzheimer's Association, 2012). This means that only about 25% of all instances of AD are estimated to be due to hereditary influences.

More importantly, biological pathways for the build-up of beta-amyloid plaques between neurons in the brain and the abnormal tau protein within the neurons causing tangles were beginning to be understood in the 1980's (see Characteristics of Alzheimer's Disease in this chapter for further explanation; National Institute on Aging & National Institutes of Health, 2011). Diagnostic criteria for AD were also created in the 1980's and are still in use today (Alzheimer's Association, 2012; McKhann et al., 2011). Although recent changes to diagnostic guidelines have been proposed, they are not yet in widespread use, and most clinical settings still rely on the original criteria from the 1980's (see section on Diagnosis of Alzheimer's Disease in this chapter).

In the 1990's additional genetic mutations thought to be partially responsible for acquiring AD were discovered (National Institute on Aging & National Institutes of Health, 2011). Although separate genes for both early-onset and late-onset forms of AD were identified, the genetic link still remained largely unclear due to the majority of sporadic instances (Alzheimer's Association, 2012). Additionally, virtually all sporadic cases are late-onset (Alzheimer's Association, 2012), and while the exact cause of these cases is not known, it is believed that genetics may still play a part. One major genetic factor that was identified as a likely contributor to developing AD is the presence of the APOE-e4 allele, the primary gene which is suspected as playing a role in developing AD late in life (Alzheimer's Association, 2012; Richter & Richter, 2004). Although having the APOE-e4 allele is a well-known risk factor for developing late-onset AD, people with two APOE-e4 alleles (i.e., one from each parent) exhibit an earlier age of onset, and also show higher beta-amyloid plaque counts and marked reductions in Ach as compared to non- APOE-e4 allele carriers (Alzheimer's Association, 2012; Richter & Richter, 2004). The APOE-e4 allele provides one potential biomarker for AD that is often used to facilitate diagnosis, especially in recently proposed diagnostic criteria for AD (see Diagnosis of Alzheimer's Disease below for further explanation; McKhann et al., 2011).

The 1990's also brought the distinction of Mild Cognitive Impairment (MCI) from AD (National Institute on Aging & National Institutes of Health, 2011). While MCI can be a precursor to AD, it is now distinguished as a separate diagnosis, sometimes caused by AD and sometimes by other causes (see section on MCI in this chapter; Alzheimer's Association, 2012; National Institute on Aging & National Institutes of Health, 2011). Also important in this decade is the appearance of the first drugs used to treat AD. While the drugs helped with slowing the progression of some symptoms of AD, they were still quite limited, not unlike the current drugs

available today (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011).

The 2000's brought about other drugs for the treatment of AD, although, they were still limited to affecting only certain symptoms of the disease (Alzheimer's Association, 2012; National Institute on Aging & National Institutes of Health, 2011). Additionally, these drugs merely slow the progression of worsening of symptoms, and do almost nothing for the actual physical deterioration of the brain associated with AD (U.S. Department of Health and Human Services, 2011). A vaccine acting on eliminating the beta-amyloid plaque build-up in the brain was also being researched in this decade, although it was found not to have a significant effect on AD (U.S. Department of Health and Human Services, 2011). Research on the prevention of AD, including other vaccination methods, is still underway (U.S. Department of Health and Human Services, 2011; Williams, Plassman, Burke, Holsinger & Benjamin, 2010).

Several other genes have also been discovered during this time that have some influence on developing AD, although the link between these genes and the risk of developing the disease is not as strong as for APOE-e4 (U.S. Department of Health and Human Services, 2011; Williams et al., 2010). These more recently discovered genes, however, along with APOE-e4, all seem to be involved in similar biological pathways, which may partially explain their influence and also possibly elucidate some of the underlying biological processes involved in AD. The presence of the APOE-e4 allele or the other abovementioned genes in persons with AD demonstrate their possible genetic influence on the risk of developing the disease, however, it does not make acquiring AD inevitable for the most part. It merely raises the odds of developing the disease, and current researchers consider the overall genetic influence on risk of AD to be only modest (U.S. Department of Health and Human Services, 2011; Williams et al., 2010).

The one exception to the inevitability of acquiring AD is genetic mutations discovered during this time, which are responsible for less than 1% of instances of the disease (Alzheimer's Association, 2012). There are three known genetic mutations that can be considered underlying causes of AD. In all three mutations the genes are involved in abnormal protein synthesis, with one specifically affecting a beta-amyloid precursor (National Institute on Aging & National Institutes of Health, 2011). However, the other two mutations, while not direct precursors, are also involved in the production of beta-amyloid. These genetic defects almost guarantee developing AD, and usually with a younger onset. People with these genetic defects normally will develop symptoms before the age of 65, with symptoms sometimes starting as young as age 30 (Alzheimer's Association, 2012). Because these genetic defects are involved in either dysfunctional production or clearance of beta-amyloid, this demonstrates a robust link in the accumulation of beta-amyloid in the brain and having AD (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011). Because of the strength of association between these genetic mutations and beta-amyloid and acquiring AD, these biomarkers that are now able to be detected early on can be a reliable source for diagnosis.

The most recent developments in AD research include the advancements in biomarkers, including neuro-imaging technology that allows the plaques in the brain to be revealed without the previously required posthumous examination of the brain (Alzheimer's Association, 2012). Neuro-imaging, however, is far from perfect. Images of the brain with the technology available today may reveal possible plaque build-up between neurons, although the imaging resolution is not high enough to reveal individual neurons or the presence of tau protein within the neuron (U.S. Department of Health and Human Services, 2011). While tau proteins cannot be positively identified with brain imaging, the loss of functioning or shrinkage within specific areas of the

brain can be revealed and often indicate the accumulation of tau protein (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011). The biomarkers of this brain dysfunction and shrinkage that results from the presence of plaques and tangles, while not perfect, can make definitive diagnoses of AD more probable.

Other biomarkers include the abnormal presence of beta-amyloid and tau protein in cerebrospinal fluid or blood, which also does not require physical examination of the brain after death (Alzheimer's Association, 2012; National Institute on Aging & National Institutes of Health, 2011). The amount of beta-amyloid and tau protein in cerebrospinal fluid and blood is thought to be an indicator of their levels within the brain. This, along with neuro-imaging, can reveal a greater possibility of a positive AD diagnosis than ever before. Biomarker technology is mostly what led to proposed changes in the diagnostic criteria for AD in 2011 (McKhann et al., 2011), but, because of the relative inaccuracy of biomarkers due to the current state of the technology available, biomarkers cannot be relied on as the sole method of diagnosis for AD (see section on Diagnosis of Alzheimer's disease; Alzheimer's Association, 2012; McKhann et al., 2011). However, these recent advancements in AD research do help increase the understanding of the biological pathways and possible underlying causes of the disease. Although the etiology of AD remains largely unknown (Alzheimer's Association, 2012; National Institute on Aging & National Institutes of Health, 2011), research continues to uncover additional, potential biological pathways, as physiological mechanisms underlying the symptomology of the disease.

Recent research has discovered myriad potential biophysiological factors which may influence a person's risk of developing AD; however, evidence for the influence of most is sparse or weak at the present time (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011). Research is currently in progress on discovering the exact functions

of some newly-discovered genes and other biophysiological mechanisms associated with AD, and continuing advancements in technology are making this research more promising. However, this means that currently, the actual cause and risk of developing AD may be too complex to be fully understood (Alzheimer's Association, 2012). For many years it was assumed that developing AD or related dementias with advancing age was unavoidable and could not be prevented or postponed in one's senior years (e.g., senile dementia), but, because the genetic influence is not the definitive cause in the majority of cases, and because many other factors are involved including some lifestyle factors that are modifiable, almost no one is absolutely destined to get AD (Alzheimer's Association, 2012; Richter & Richter, 2004; Williams et al., 2010). Although the advancements in the research of genetic factors and biological pathways involved in AD do not point to definitive etiology of the disease, they have revealed greater knowledge of potential physiological mechanisms involved in AD that underlie its psychological symptomology. This deeper understanding of AD has allowed for earlier and more accurate diagnoses largely due to the better assessment of both biomarkers and symptoms of the disease. Even with early detection, AD will always have pervasive biopsychosocial effects, but it does not affect all individuals the same, putting some more at risk than others.

Risk Factors for Alzheimer's Disease

Age. The greatest known risk factor in developing AD is increasing age, with the majority of individuals with the disease aged 65 years and older (Alzheimer's Association, 2012; Richter & Richter, 2004). Research shows that the likelihood of developing AD approximately doubles every five years after 65 years of age (Williams, Plassman, Burke, Holsinger & Benjamin, 2010). Lifetime risk of developing AD in people aged 65-74 is estimated at only 9.1% for men and 17.2% for women, while the risk of developing AD for people over 85 is

astoundingly 45% (Alzheimer's Association, 2012). At the current time, little is known about why this risk increases so drastically with advancing age. One theory, based on animal models, posits that as the brain ages, it becomes less resilient to stress, which may accelerate cognitive decline since stress is known to cause degenerative changes within the brain (U.S. Department of Health and Human Services, 2011). The increased effects of stress due to age-associated cognitive decline has been specifically applied to AD by Hall and Buckwalter (1987), who created the *Progressively Lowered Stress Threshold* (PLST; see chapter 3 for further explanation). These theories point out that the escalating effects of stress may partially explain the increasing risk of developing AD as people age. Although advancing age is known to increase the likelihood of developing AD, it is important to note that aging and other risk factors are not the cause of the disease. The underlying reasons for the risk of developing AD with advancing age are still largely unknown (Alzheimer's Association, 2012; Richter & Richter, 2004).

Gender. Another possible risk factor for developing AD is one's gender. Development of AD is far more widespread amongst women than amid men, with estimates at 2/3 of all AD cases being women (Alzheimer's Association, 2012). This could be simply because of the significantly greater number of older women as compared to men, and does not necessarily represent a true gender difference (Alzheimer's Association, 2012; Richter & Richter, 2004). Because of women's relative longevity compared to men, the incidence rate of AD is naturally going to be higher among them since advanced age is a primary risk factor. For Americans over 70, it is estimated that 16% of women (3.4 million), and only 11% of men (1.8 million) have AD (Alzheimer's Association, 2012). Some researchers assume women may be slightly more at risk than men in developing AD, even when accounting for the fact that they live longer (Richter &

Richter, 2004). However, this evidence for a gender effect has been shown to interact with age. Some studies have shown that women may become more at risk above the age of 80, while other research suggests that being female is not a risk factor until over 90 years of age (Richter & Richter, 2004). Results from a large cohort study of the Dutch suggest that at a very old age, women may be more likely to have AD, while the risk of developing vascular dementia is larger for men (Richter & Richter, 2004). Nonetheless, Alzheimer's Association (2012) reports that once age is completely controlled for, gender has only a small effect and is not a significant risk factor for developing AD. Overall, it appears that gender and age may have an interactive influence in the risk of developing AD or other dementias, with gender playing a much smaller role than age.

Ethnicity. Distinct ethnic differences in the risk of acquiring AD and other dementias have also been found in survey data (Alzheimer's Association, 2012). Specifically, older African-Americans and other non-white minorities (e.g., Hispanic, Latino) have been found to be at a significantly greater risk of developing AD or other dementias, with estimates for African-Americans being two to three times as likely to have AD as Caucasians (Alzheimer's Association, 2012; Dilworth-Anderson et al., 2008). The greater frequency of AD found in minorities, especially African-Americans, is posited to be due to an earlier age of onset of the disease than in non-minorities (Alzheimer's Association, 2012). Studies also suggest differences in symptomology, with minorities experiencing more severe symptoms such as hallucinations and delusions more often than Caucasians (Alzheimer's Association, 2012). This disparity is thought to be due to differences in health status among minorities and Caucasians. Adverse health conditions such as high blood pressure and diabetes are more prevalent in minorities than

in Caucasians, which puts them at greater risk for developing AD (Alzheimer's Association, 2012).

Hormonal Factors. Researchers of AD propose that stress, which triggers a flood of hormones that can damage brain cells, can play a part in developing AD (Richter & Richter, 2004; U.S. Department of Health and Human Services, 2011). The aforementioned PLST theory (Hall & Buckwalter, 1987) suggests that people with AD are more prone to the effects of stress, and studies on persons with AD have found high levels of some hormones, especially stress hormones (e.g., cortisol) in participants (U.S. Department of Health and Human Services, 2011). Aging itself seems to reduce the brain's ability to stop the production of stress hormones since levels typically increase with age, with or without the presence of AD (Richter & Richter, 2004). Stress hormones are known to increase inflammation in the body and brain, and high levels of inflammation are also associated with having AD (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011). AD is likely the result of numerous factors, and there is the possibility that the brain's increasing reaction to stress hormones as we age plays a role.

Another hormone that affects the risk for developing AD is estrogen, which possibly has neuro-protective effects (Richter & Richter, 2004; U.S. Department of Health and Human Services, 2011). The female hormone appears to improve the diminishing cognitive functioning due to age. Post-menopausal women who have low estrogen levels appear to have an increased risk of developing cognitive impairment and AD than women of similar age with higher levels of estrogen (U.S. Department of Health and Human Services, 2011). Prior studies have demonstrated estrogen's effectiveness for protecting the brain, and older women on hormone replacement therapy were found to be nearly 40% less likely to develop AD in one study, and the

longer the women were on the therapy, the less the risk (Williams et al., 2010). Estrogen's effects on risk of AD are posited to be due to the protection of neurons and enhancing brain cell health (Richter & Richter, 2004). Estrogen is also believed to stimulate the growth of synapses and help the brain maintain its output of acetylcholine (Ach), a neurotransmitter essential to learning and memory. It has been demonstrated consistently in prior research that persons with AD show severe deficits of Ach and that people with higher estrogen levels also have higher levels of Ach (Alzheimer's Association, 2012; Richter & Richter, 2004). This means that estrogen may have neuroprotective effects against AD.

Dietary Factors. A study comparing prevalence rates of AD in Japanese- and African-Americans with very different diets found that caloric and fat intake highly correlated with AD prevalence (Grant, 1997). Highly caloric and fatty foods can oxidize into neurotoxins, by creating free radicals in the blood which then enter the brain and cause inflammation of the neurons and eventual cell death. Not all fats seem to be the culprit, however. Only saturated and hydrogenated fats have been linked to an increase in the risk of developing AD (Grant, 1997; U.S. Department of Health and Human Services, 2011). Figures about eating patterns in England, Sweden, Spain, Japan, and Singapore all point to a link between less saturated fat in the diet and less incidence of AD (Grant, 1997; U.S. Department of Health and Human Services, 2011). High consumption of saturated fats has a well-known negative association with cardiovascular health, which is also associated with a higher risk of AD (Alzheimer's Association, 2012). However, other researchers consider the link between saturated fat in the diet and increased risk of AD to be insufficient to demonstrate a significant effect at this time (Williams et al., 2010).

Another dietary factor that may be involved in lowering the risk of developing AD is the consumption of antioxidants, which are mostly found in fruits and vegetables (Grant, 1997; U.S. Department of Health and Human Services, 2011; Williams et al., 2010). Because oxidation in the body can cause tissue damage and cell death, including within the brain, antioxidants may help prevent signs of AD from appearing by neutralizing free radicals in the blood before they can do any damage. Research that adds some weight to the theory that AD may in part be caused by damage from free radicals has discovered that beta-amyloid, a plaque made of proteins that build up in the brain between neurons, and a suspected underlying factor in developing AD, stimulates the release of toxic free radicals in the blood (Grant, 1997). High levels of free radicals in the bloodstream create the condition of oxidative stress in the body, which is also typically found in those with AD (U.S. Department of Health and Human Services, 2011). The effectiveness of antioxidants against AD was shown in one study utilizing vitamin E, which found that it significantly reduced the normal worsening of symptoms as the disease progresses (Grant, 1997). Antioxidants include vitamins A (including beta-carotene, a precursor to vitamin A), C, and E, and trace minerals such as selenium, and low levels of these antioxidants have been found in those with AD (Grant, 1997; Williams et al., 2010). However, recent research has focused mostly on vitamin E and selenium, since they have shown the most promise (U.S. Department of Health and Human Services, 2011; Williams et al., 2010). Although research studies have revealed some effectiveness of antioxidants in the prevention of AD, the current research suggests that the benefits of antioxidants are still quite limited. Additionally, the evidence for antioxidants providing some protection against AD is stronger when they are consumed from fresh fruits and vegetables, and not from vitamin supplements (Williams et al., 2010). Research is underway to further elucidate the specific role of some antioxidants in the

prevention of dementia, with trials currently studying the effects of vitamin E and selenium (U.S. Department of Health and Human Services, 2011).

Genetic Factors. There is a large body of evidence that demonstrates a strong relationship between AD and related dementias and the influence of genetic factors (Alzheimer's Association, 2012; Richter & Richter, 2004; Williams et al., 2010). One such association lies within AD's hereditary nature in some instances. Younger-onset AD, while relatively rare compared to late-onset AD, has been shown to have a strong familial link (Alzheimer's Association, 2006, 2012). The risk of developing late-onset AD has also been shown to significantly rise when first-degree relatives (i.e., parents or siblings) also have the disease (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011). If one immediate, first-degree relative has the disease, the risk of developing late-onset AD is estimated to quadruple, and if two immediate relatives have the disease, the estimated risk is drastically increased, with some estimates as high as a forty-fold increase (Alzheimer's Association, 2012; Richter & Richter, 2004). Consequently, the risk of having both parents with the disease comes as a close second to the risk of advancing age, the primary risk factor for developing late-onset AD (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011).

The familial link of AD is so robust that it is what led researchers to examine and discover some of the underlying genetic mechanisms. However, research has shown that even for people with a strong family history of younger-onset AD, only roughly 50 percent of cases are related to a known genetic defect, and that about 75 percent of all AD cases are classified as sporadic, occurring in people with no history of the disorder in their family (Alzheimer's Association, 2012; Richter & Richter, 2004). This means that only about 25% of all instances of AD are estimated to be due to hereditary influences. However, it is important to note that the

familial link of AD may also partially be due to shared environments and lifestyle factors, which tend to be similar within families (Alzheimer's Association, 2012). Additionally, virtually all sporadic cases are late-onset, and while the exact cause of these cases is not known, it is believed that genetics may still play a part.

One major genetic factor that was identified as a likely contributor to developing AD is the presence of the aforementioned APOE-e4 allele. This allele is the primary gene which is suspected as playing a role in developing AD late in life (Alzheimer's Association, 2012; Richter & Richter, 2004; Williams et al., 2010). Although having the APOE-e4 allele is a well-known risk factor for developing late-onset AD, patients with two APOE-e4 alleles (i.e., one from each parent) exhibit an earlier age of onset, and also show higher beta-amyloid plaque counts and marked reductions in Ach as compared to non- APOE-e4 allele carriers (Alzheimer's Association, 2012; Richter & Richter, 2004). Carrying even two APOE-e4 alleles, however, does not guarantee developing AD with advancing age. Williams et al. (2010), after reviewing over 250 prior studies on AD, considers the risk of developing AD specifically from carrying the APOE-e4 genotype to be no more than moderate.

Several other genes have also been discovered as having some influence on developing AD, although the link between these genes and the risk of developing the disease is not as strong as for APOE-e4 (U.S. Department of Health and Human Services, 2011; Williams et al., 2010). These recently discovered genes, however, along with APOE-e4, all seem to be involved in similar biological pathways, which may partially explain their influence and also possibly elucidate some of the underlying biological process involved in AD. The presence of the APOE-e4 allele or the other abovementioned genes in persons with AD demonstrate their possible genetic influence on the risk of developing the disease, however, it does not make acquiring AD

inevitable for the most part. It merely raises the odds of developing the disease, and current researchers consider the overall genetic influence on risk of AD to be only modest (U.S. Department of Health and Human Services, 2011; Williams et al., 2010).

The one exception to the inevitability of acquiring AD is genetic mutations that are responsible for less than 1% of instances of the disease (Alzheimer's Association, 2012). There are three known genetic mutations that can be considered as causing AD. In all three mutations the genes are involved in abnormal protein synthesis, with one specifically affecting a beta-amyloid precursor (National Institute on Aging & National Institutes of Health, 2011). However, the other two mutations, while not direct precursors, are also involved in the production of beta-amyloid. These genetic defects almost guarantee developing AD, and usually with a younger onset. People with these genetic defects normally will develop symptoms before the age of 65, with symptoms sometimes starting as young as age 30 (Alzheimer's Association, 2012).

Recent research has discovered myriad potential biological factors, including a number of other genes, which may also influence a person's risk of developing AD; however, evidence for the influence of each alone is sparse at the present time (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011). Research is currently in progress on discovering the exact functions of some newly-discovered genes and biological mechanisms associated with AD, and continuing advancements in technology are making this research more promising. However, this means that currently, the actual cause and risk of developing AD may be too complex to be fully understood (Alzheimer's Association, 2012). For many years it was assumed that developing AD with advancing age was unavoidable and could not be prevented or postponed in one's senior years, but, because the genetic influence is not the definitive cause in the majority of cases, and many other factors are involved- including some lifestyle factors that

are modifiable- almost no one is absolutely destined to get AD (Grant, 1997; Richter & Richter, 2004; Williams et al., 2010).

Education and Cognitive Stimulation. Some research has suggested that the number of years of education one has may contribute to the risk of developing AD, with those with fewer years of education having higher incidences of the disease (Alzheimer's Association, 2012; Richter & Richter, 2004; Williams et al., 2010). Having more years of formal education has been suggested as a factor for reduced risk, possibly because of increased synaptic and/or dendritic complexity and density in one's brain resulting from greater cognitive stimulation (Chapman, Weiner, Rackley, Hynan, & Zientz, 2004; Williams et al., 2010). Those with more education presumably have exercised their brains more, which is thought to reinforce and build up the synaptic networks in the brain. Studies have shown that those with university-level education and those whose occupation or daily activities have high mental demands are less likely to show signs of AD or other cognitive impairments than people with lower levels of education or less cognitively-demanding daily involvement (Richter & Richter, 2004; Williams et al., 2010). Thus, one potential protective mechanism against developing AD appears to be the choice to expand and continually use your mind by engaging in mentally challenging activities, including problem solving, completing logic puzzles, reading, and playing and listening to music. However, because reduced risk of AD is based on prior educational involvement and continuing and current participation in cognitively-stimulating activities, the addition of cognitive stimulation to treatment regimens for people who already have the disease is likely to have a much smaller effect. Though the effects of AD can be devastating, the influence of education and cognitive stimulation known from the aforementioned research demonstrates that people do have some

control over slowing age-related cognitive decline and the risk of developing AD by altering these and other lifestyle factors.

Lifestyle Factors. A person's lifestyle choices regarding diet, exercise, and other aspects of wellbeing are known to significantly influence one's health, and mounting evidence suggests that one's overall health is also linked to brain health (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011). There is some evidence that the accumulation of cholesterol and other fats in blood vessels may contribute to AD (U.S. Department of Health and Human Services, 2011; Williams et al., 2010). This means that maintaining a healthy cardiovascular system through regular exercise, a healthy diet, and avoidance of smoking may decrease the risk of developing AD and possibly slow the cognitive decline associated with it (Alzheimer's Association, 2012; Williams et al., 2010). Future research is necessary to separately assess the individual effects of more specific dietary factors and different forms of exercise on AD, and longer-term studies are still needed to further strengthen the association between cardiovascular health and rate of cognitive decline in people with AD (U.S. Department of Health and Human Services, 2011).

In addition to cardiovascular disease, having diabetes has also been linked to cognitive decline and greater incidence of AD (U.S. Department of Health and Human Services, 2011; Williams et al., 2010). This is likely due to insulin's role in many biological processes involved in cognitive functioning, since people with diabetes are either deficient or resistant to this endogenous hormone (U.S. Department of Health and Human Services, 2011). It is important to note that adult-onset diabetes, like cardiovascular disease, is largely preventable through modification of lifestyle factors such as diet and exercise as previously mentioned, further demonstrating some control over the risk of developing AD (Alzheimer's Association, 2012;

U.S. Department of Health and Human Services, 2011). However, more research is still needed to strengthen the association between diabetes and cognitive decline and risk of developing AD, especially with regard to glycemic control in people with adult-onset diabetes, since prior research did not take this into account (U.S. Department of Health and Human Services, 2011). For example, a person diagnosed with adult-onset diabetes may alter diet and exercise habits to help control blood glucose, and by doing so, may reduce their risk of developing AD, although the correlational studies mentioned have not assessed this. At present, it is merely known that having diabetes, regardless of how well it is controlled, increases your risk for developing AD (U.S. Department of Health and Human Services, 2011; Williams et al., 2010).

Another potential lifestyle risk factor for cognitive decline and possibly developing AD is low levels of social engagement (Alzheimer's Association, 2012; Williams et al., 2010). Prior research has shown that remaining socially active supports brain health, and that a lack of social engagement and self-reported chronic loneliness are associated with poorer mental health in general (Williams et al., 2010). Studies have also revealed that people who do not cohabitate with a partner late in life are not only more depressed, but also potentially at greater risk for developing AD than people who do not remain single or live alone (Williams et al., 2010). Additionally, decreased social networks and dissatisfaction with social contacts have been associated with higher risk of AD (Williams et al., 2010). However, Alzheimer's Association (2012) considers the evidence for the influence of social engagement on AD to be less convincing than for other lifestyle risk-factors such as having cardiovascular disease, due to fewer studies having been done in this area and using smaller sample sizes. It is also possible that the decreases in social engagement found in these studies could have been due to early

symptoms of AD, since social withdrawal can be characteristic of early stages of the disease (Alzheimer's Association, 2012).

Work Environment. The occurrence of cognitive impairment and dementia, including AD, in the workplace can be affected by the demand of one's job duties and the conditions of one's working environment (Ansiau, 2005; Feychting et al., 1998; Finkel et al., 2009). For instance, one study revealed a significant positive relationship between work-related cognitive stimulation and cognitive performance (Ansiau, 2005). Even though workers' age was associated with normal age-related decline in cognitive performance, results specified that older workers were less likely to benefit from cognitive stimulation at work than their younger counterparts. Ansiau (2005) concluded that, in general, older workers are not exposed to as cognitively stimulating work environments as younger workers, but that the older workers who were exposed to more cognitively stimulating work environments had higher levels of cognitive functioning than other older workers. Similarly, another study found that occupational complexity positively correlated with cognitive performance on verbal, spatial, and speed factors (Finkel et al., 2009). However, this study found that while occupational complexity was associated with slower declines in verbal cognitive performance before retirement, after retirement older adults declined faster in spatial cognitive abilities. Consequently, Finkel et al. (2009) argue that one's occupational complexity may help slow down specific types of age-related cognitive decline in performance.

Harsher environmental working conditions have also been associated with quicker cognitive decline and dementia in older workers (Feychting et al., 1998; Mortimer et al., 1991). Blue collar workers have been found to have more instances and earlier onset of dementia symptoms than those in higher status jobs due to differences in working environments (Mortimer

et al., 1991). One reason for this is the greater number of workplace accidents, such as head injuries, in blue collar workers (Mortimer et al., 1991). One study also revealed that exposure to extremely low-frequency magnetic fields at work (e.g., at a power plant) can possibly influence the development of dementia (Feychting et al., 1998). However, another study found that exposure to organic solvents and lead in workers at a chemical plant did not correlate with an increased risk of dementia (Shalat, Seltzer, & Baker, 1988). Taken together, these studies indicate that only specific types of working environments may contribute to the occurrence of dementia in the workplace; nonetheless, there is growing concern among employers and others regarding the problems of harsh work environments, due to the present aging of the population that remains in the workforce. In addition, occupational complexity and the availability of cognitive stimulation at work is also a concern of employees wishing to retain their mental functioning and perhaps stave off symptoms of AD.

Characteristics of Alzheimer's Disease

Symptomology of Alzheimer's Disease

Alzheimer's disease (AD) is a progressive, degenerative disease which has devastating effects that can ultimately rob a person of their personality, cognitive and physical functioning, and in the end, be the cause of death (Alzheimer's Association, 2012; Richter & Richter, 2004). The primary biological characteristic of AD is the increasing dysfunction or death of neurons within the brain (Alzheimer's Association, 2012). This was found to be due to the build-up of beta-amyloid plaques between neurons, which hinders their connections, and neuro-fibular tangles associated with increases in cross-linking of tau protein (i.e., tau proteins abnormally bind and block biochemical pathways) within the neurons, also blocking communication between them (Alzheimer's Association, 2012; U.S. Department of Health and Human Services,

2011). Psychosocial symptoms that result from this brain degeneration are problems with memory, thinking, and behavior, all which worsen as the disease progresses (see Diagnostic Criteria for Alzheimer's Disease in this chapter for additional information; Alzheimer's Association, 2012; Richter & Richter, 2004). Eventually, persons with AD will need total care, since they will not be able to perform even basic daily activities such as bathing or eating on their own (Alzheimer's Association, 2012). Once diagnosed with AD, however, the length of time it will take for the advancement of the disease to this severe stage varies between people, and therefore the course of AD is not entirely predictable. The traditional stages of AD will be discussed below, along with a possible precursor to the earliest stage.

Mild Cognitive Impairment. Mild Cognitive Impairment (MCI) is a title used for the diagnosis of a level of cognitive impairment that does not significantly interfere with daily activities, such as a noticeable decline in memory retention and recall which may be bothersome, but is not severe enough to cause any significant difference in daily functioning in one's life (Alzheimer's Association, 2012; Jack et al., 2011). Abstract thought and planning may also be mildly affected. Symptomology of MCI is similar to the early warning signs of AD, but MCI can sometimes, but not always, be a precursor to developing AD (U.S. Department of Health and Human Services, 2011). However, people diagnosed with MCI or other cognitive impairment not due to dementia were found to be at a much higher risk for developing AD (e.g., 12-15%) than cognitively-healthy older adults (e.g., 1-2%, Williams et al., 2010). Additionally, Alzheimer's Association (2012) estimates that nearly half of all people who visit a doctor for symptoms of MCI will develop AD within 3-4 years. Therefore, it is recommended that frequent assessments be made if diagnosed with MCI, in order to track its possible progression to AD. Recently

proposed guidelines that classify AD as a possible cause for MCI will be discussed further in the section on the NIH proposed changes to criteria for AD.

Agitation. One prominent symptom of AD is increasing levels of agitation as the disease progresses; however, since late-stage AD affects physical and verbal functioning (see Stages of Alzheimer’s Disease in this chapter), people who have late-stage AD may not be able to express these feelings well, therefore agitation may seem to decrease along with functionality (Gardiner & Furois, 2000; Ledger & Baker, 2007; Richter & Richter, 2004; Sung & Chang, 2005; Witzke et al., 2008). Agitation in people with AD can be defined as any inappropriate behavior that is unrelated to needs, and can be separated into either *verbal* or *physical* behaviors that can either be classified as *aggressive* or *not aggressive* (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008). An example of a *verbal non-aggressive* agitated behavior would be “repeated unwarranted requests for attention,” while *verbal aggressive* behaviors include “threatening or insulting language” (Ledger & Baker, 2007, p. 333). *Physical non-aggressive* behaviors can be any repetitive inappropriate behaviors, which are commonly such things as “tapping, wandering, or undressing at inappropriate times” (Ledger & Baker, 2007, p. 333). *Physical aggressive* behavior involves acting out towards either objects or others, and includes “throwing or destroying objects” and “pushing” or “grabbing” other people (Ledger & Baker, 2007, p. 333). Agitation often results from frustration experienced by the AD sufferer of not being able to function optimally, either cognitively or physically, as they have prior to having the disease (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008). If left uncontrolled, agitation can sometimes lead to further disruptive or aggressive behaviors if not dealt with by caregivers or others, and may put AD sufferers at risk

of harm to themselves or others (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008).

Stages of Alzheimer's Disease. Since the progression of AD can last for as long as 20 years (Richter & Richter, 2004), it is identified by distinct stages of its advancement. Currently, the stages of AD commonly used for clinical diagnosis are identified as *mild/early-stage*, *moderate/mid-stage*, and *advanced/severe/late-stage* (Alzheimer's Association, 2012). In the early stage of AD, people may have trouble remembering recent events, activities, or the names of familiar people or things, and show decrements in other cognitive functions such as abstract reasoning and judgment (Alzheimer's Association, 2012; Richter & Richter, 2004). They also may not be able to solve simple problems, show reduced spontaneity, apathy, withdrawal, and disorientation in familiar environments (Richter & Richter, 2004). People with AD in the early stage will probably notice and be bothered by these symptoms, but usually will not need a caregiver since physical functionality normally remains intact and mental functioning is not yet impacted severely (Alzheimer's Association and the National Alliance for Caregiving, 2004). Since caregivers are most often family members, however, they may aid in the care of the person with AD at this time even though it is not essential at this early stage of the disease.

Other symptoms of the early stage of AD include the aforementioned accumulation of beta-amyloid plaques and neuronal tangles due to tau protein within the brain (Alzheimer's Association, 2012; Richter & Richter, 2004). The abnormal build-up of these proteins is thought to be one underlying cause for the death of neurons and resulting dysfunction in the brain associated with AD. These physical characteristics of AD can be present and detected even before the psychological symptoms of the disease appear (Alzheimer's Association, 2012; Jack et al., 2011; McKhann et al., 2011). AD will normally affect some areas of the brain more than

others, with areas associated with the formation of new memories (e.g., the hippocampus) typically greatly affected (National Institute on Aging & National Institutes of Health, 2011). The accumulation of beta-amyloid and tau protein throughout the brain continues as AD progresses, which consequently leads to the increasing deterioration of neurons and results in greater shrinkage and dysfunction within the brain (National Institute on Aging & National Institutes of Health, 2011). However, there is great variability in the progression of AD into its sequential stages, making the predictability of remaining functionality once diagnosed with AD difficult.

The early symptoms will normally progress to a greater level of severity and additional symptoms will present themselves in the middle stage of AD. Once the disease progresses to its middle stage, people with AD may experience language impairments such as problems with word finding and naming familiar objects (Alzheimer's Association, 2012; Richter & Richter, 2004). This is due to the further spreading of the death of neurons, usually into the cerebral cortex, which is involved with language abilities, sensory processing, and conscious thought (National Institute on Aging & National Institutes of Health, 2011). People in this stage of AD may also lose the ability to perform tasks that they have formerly known well, even basic grooming such as brushing their teeth and combing their hair, despite intact motor ability (Richter & Richter, 2004; U.S. Department of Health and Human Services, 2011).

The symptoms from the early stage also worsen and are more easily noticed. They usually become serious enough to cause people with AD and their family members to seek medical help (Alzheimer's Association, 2012; Alzheimer's Association and the National Alliance for Caregiving, 2004; Richter & Richter, 2004). AD-associated symptoms begin to persistently interfere with daily activities in the middle stage, and AD sufferers may now require

a caregiver (Alzheimer's Association and the National Alliance for Caregiving, 2004; Richter & Richter, 2004). AD sufferers may no longer think clearly and they can consistently fail to recognize familiar people and places. They may also begin to have problems speaking, understanding, reading, and writing in the middle stage of the disease. All of these symptoms can result in feelings of agitation or possibly result in aggressive behavior in people with AD, which also typically appear in the middle stage and usually increase as the disease continues to progress (Richter & Richter, 2004; U.S. Department of Health and Human Services, 2011).

Behavioral problems also appear in the middle stage, such as wandering, outbursts of anger, agitation and aggression, and repetitive or sudden movements (e.g., muscle twitches, tics), and inappropriate undressing and vulgar language or behavior (Alzheimer's Association, 2012). This severe impact to functionality is the hallmark of the middle stage of AD (Alzheimer's Association, 2012; Richter & Richter, 2004). Without a caregiver at this stage, people with AD may not be able to care for themselves, and as a result, may put themselves at risk of harm to themselves and others (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011). People at this stage will typically require help with the most basic daily activities, including bathing, dressing, eating, and using the bathroom, and cognitive functioning becomes severely impacted due to continued shrinkage of affected areas within the brain. The greater shrinkage within the brain also results in increased ventricles within the brain (i.e., space between areas of the brain containing cerebrospinal fluid), another biomarker for AD. The death and dysfunction of neurons causes this shrinkage and disrupts the communication between neurons within the brain, causing the slowing or malfunction of the signals normally required to carry out physical activities (U.S. Department of Health and Human Services, 2011). This physical deterioration of the brain continues as AD progresses into its final stage.

In its late, most severe stage, people with AD start to show a loss of motor function with increased muscle rigidity as a frequent indicator, and the symptoms from the earlier two stages also progressively worsen (Alzheimer's Association, 2012; Richter & Richter, 2004; U.S. Department of Health and Human Services, 2011). Language ability becomes even more impaired, sometimes making coherent speech impossible, with complete mutism also potentially occurring (Alzheimer's Association, 2012; Richter & Richter, 2004). This can make a person with late-stage AD have great difficulty expressing their needs to caregivers and can often result in frustration, agitation, or aggression (Alzheimer's Association, 2012). These characteristics of late-stage AD are thought to be due to the continuing accumulation of plaques and tangles, and thus deterioration, which at this stage have spread throughout the brain, including areas involved in motor and speech control (Richter & Richter, 2004; U.S. Department of Health and Human Services, 2011). Individuals in this stage may also have disturbed sleep and wake cycles, experience regular muscle jerks and possible seizures, and may become severely anxious, agitated, or aggressive, possibly putting themselves at harm to themselves or others, making caregiving a necessity (Alzheimer's Association, 2012; Alzheimer's Association and the National Alliance for Caregiving, 2004).

Eventually, patients in the late stage of AD will become bedridden and need total care (Alzheimer's Association, 2012; Alzheimer's Association and the National Alliance for Caregiving, 2004). The lack of movement in bedridden people with late-stage AD can often result in greater instances of infections, including pneumonia (Alzheimer's Association, 2012). While being bedridden increases the risk for pneumonia, difficulty in swallowing due to motor dysfunction in late-stage AD also often results in liquids entering the lungs and can be a primary cause of pneumonia (Alzheimer's Association, 2012; U.S. Department of Health and Human

Services, 2011). Because of this, AD-related pneumonia is thought to contribute to AD-related death in many co-occurrences of these two diseases (Alzheimer's Association, 2012). While many of the symptoms of AD may be present and simply increase in severity throughout the progression of AD through its stages (e.g., cognitive and behavioral problems), death is ultimately the end result of the disease itself, with or without secondary infections (Alzheimer's Association, 2012). The unrelenting deterioration of one's brain makes death from AD inevitable.

The three stages of AD currently in clinical use for diagnostic purposes that were discussed above provide a clear framework for the progression of the disease. The stages help define both the biophysiological and psychological symptomology of AD as it progresses. However, these stages of symptomology and diagnoses were defined over 25 years ago, and the current AD researchers at NIH and Alzheimer's Association feel that they are outdated since much advancement in AD research has occurred during this time period (McKhann et al., 2011). The NIH workgroups, working with Alzheimer's Association, have therefore recently proposed changes to the diagnostic criteria, including the stages of AD.

Proposed Changes to Criteria for Alzheimer's Disease

AD is commonly separated into three main stages while symptoms of the disease are present: *mild or early stage*, *moderate or middle stage*, and *advanced, severe or late stage* (Alzheimer's Association, 2012; Richter & Richter, 2004). However, recent technological advancements have allowed earlier diagnoses and better detection of changes in the progression of AD. Currently, the three abovementioned stages of AD are still identified and are in use; however, it has been proposed that the stages be redefined as *preclinical AD*, *Mild Cognitive Impairment (MCI) due to AD*, and *dementia due to AD* (see Diagnostic Criteria for Alzheimer's

Disease below for further explication; Alzheimer's Association, 2012; McKhann et al., 2011).

The proposed changes are largely due to the refinement of assessment instruments, which has improved the detection of more subtle changes in the worsening of symptoms, and the detection of biomarkers (i.e., biological changes in the brain and body) with advanced technology such as neuro-imaging and genetic coding, before psychological symptomology is even present (Alzheimer's Association, 2012; McKhann et al., 2011). These technological advancements in the assessment of AD have allowed much earlier and more accurate diagnoses of the disease to be made, especially when utilizing the new NIH diagnostic criteria.

Diagnostic Criteria for Alzheimer's Disease

Recent diagnostic guidelines have been proposed by the National Institutes of Health (NIH) and the subsidiary National Institute on Aging (NIA) to separate AD into three distinct stages, including the diagnosis of a preclinical stage, before psychological symptoms of the disease are identifiable (Alzheimer's Association, 2012; McKhann et al., 2011). However, physicians are still generally using the older guidelines for AD diagnoses, in which psychological symptomology must be present (Alzheimer's Association, 2012). The NIH workgroups that proposed the newly refined guidelines suggest that more research needs to be done, especially with regard to biomarkers, before implementing them in clinical settings (Jack et al., 2011; McKhann et al., 2011). One reason for this is because the NIH guidelines propose a preclinical stage of AD which, since symptoms of the disease have not yet appeared, relies solely on biomarkers in order for a diagnosis to be made, and, as previously mentioned, the technology to accurately determine diagnoses by biomarkers alone is still inadequate (Alzheimer's Association, 2012; McKhann et al., 2011).

A clinical diagnosis of AD would only be made with the currently used diagnostic criteria in the final stage of the new guidelines, *dementia due to AD* (McKhann et al., 2011). This means that, according to the diagnostic criteria for AD that is currently in widespread use, the psychological symptoms of the disease would have to be severe enough to significantly affect one's daily activities in order for a diagnosis of AD to be made (Alzheimer's Association, 2012). The two earlier stages in the recent guidelines, *preclinical AD* and *MCI due to AD*, are not currently diagnosed as AD by the older guidelines currently in use. For example, the middle stage in the new NIH guidelines, *MCI due to AD*, would not typically be diagnosed as AD by the currently-used diagnostic criteria, but simply as MCI. Biomarkers would need to be used in order to identify the potential cause of MCI as AD. Additionally, *Preclinical AD* is only recognizable by biomarkers, so it would also not currently be acknowledged as AD (Jack et al., 2011; McKhann et al., 2011).

The diagnostic criteria for AD in the DSM-5 also reflect much of the newly proposed NIH guidelines. That is, the DSM-5 contains diagnostic criteria for *Mild Neurocognitive Disorder* and *Major Neurocognitive Disorder* or dementia, both of which can be attributed to AD as a possible etiology (Blazer, 2013). If either category of neurocognitive disorder (NCD) is suspected, the underlying cause is attempted to be found, with possibilities being Alzheimer's, vascular, or frontotemporal NCD. Additionally, similar to the NIH guidelines, memory and learning problems, while still the most common symptoms of AD, do not have to be present for a diagnosis to be made. Other symptoms such as attention, executive functioning, language, perceptual motor problems, or social cognition may also be severe enough for a diagnosis of Alzheimer's NCD to be made even in the absence of memory or learning problems, according to the DSM-5 criteria (Blazer, 2013).

In the clinical stages where symptoms are present, however, AD primarily affects cognition, and especially memory. At first, the only symptom may be mild forgetfulness, which can be confused with normal age-related changes in cognitive functioning (Alzheimer's Association, 2012; Richter & Richter, 2004). However, people with only mild forgetfulness do not have AD, since they would not meet all the current diagnostic criteria, which includes the development of multiple cognitive or physical deficits (Alzheimer's Association, 2012; Cairns, Evans, & Prince, 2005; McKhann et al., 2011). The recently proposed guidelines from NIH on AD diagnoses require physical or cognitive impairment in at least two domains, including learning, reasoning or judgment, visuospatial abilities, language, and personality or behavior (Jack et al., 2011; McKhann et al., 2011). It is important to note that according to the revised guidelines, impaired memory does not have to be one of the two domains affected. This is because AD may initially manifest in other ways such as negatively affecting abstract reasoning or judgment instead of memory (Alzheimer's Association, 2012). The impairment in two domains must also be severe enough to negatively interfere with one's usual daily activities and not be explained by another disorder in order for a diagnosis of AD to be made. Additionally, the concurrent presence of biomarkers along with AD-related symptoms may also help distinguish the probability of early AD or MCI due to AD from normal age-related cognitive decline or another disorder (McKhann et al., 2011).

Although biomarkers may provide some evidence of the presence and progression of AD, there is no standardization for using them in diagnosis at this time (Jack et al., 2011; McKhann et al., 2011). Biomarkers for AD can include brain imaging, displaying plaque build-up (e.g., beta-amyloid) between neurons and areas of dysfunction possibly due to the accumulation of tau protein within neurons which can lead to the tangled neuro-fibers typically found in AD;

elevated levels of beta-amyloid or tau protein in cerebrospinal fluid or blood; and the presence of one or two APOE-e4 alleles or other possible AD-related genes, marking a genetic predisposition and raising the odds of AD (Alzheimer's Association, 2012). However, the NIH workgroups that defined the new diagnostic guidelines consider it premature to rely on biomarkers to specifically define cutoff points for stages of AD. Nonetheless, the proposed diagnostic guidelines do allow more precise classification of the occurrence of AD by relying on both the presence of symptomology and biomarkers concomitantly (Jack et al., 2011; McKhann et al., 2011).

In addition to redefining the stages of AD, the NIH-proposed guidelines describe three potential diagnoses: 1) *probable AD*, 2) *possible AD*, and 3) *probable or possible AD with pathophysiological evidence* (p. 265, McKhann et al., 2011). *Probable AD* meets the aforementioned diagnostic criteria for AD, and exhibits an insidious onset while being able to rule out other explanations for symptoms. *Possible AD* is distinguished from *probable AD* by *possible AD* having an atypical course (e.g., sudden onset of symptoms), history of cerebrovascular disease (e.g., stroke), or evidence of other neurological diseases. *Probable or possible AD with pathophysiological evidence* indicates the presence of biomarkers in either of the other two diagnoses. However, the presence of biomarkers is not always clearly positive or negative with the current methods of detection (Alzheimer's Association, 2012; McKhann et al., 2011). While AD usually has a subtle onset and progresses slowly, these new diagnostic guidelines and refined detection techniques have allowed earlier exposure of the disease, and have also allowed improved distinction from other age-related causes of cognitive impairment such as MCI not due to AD (Alzheimer's Association, 2012; McKhann et al., 2011).

The guidelines proposed by NIH classify MCI as the second stage of AD if the cognitive impairment is thought to be due to AD, since the first, preclinical stage is asymptomatic (Alzheimer's Association, 2012; McKhann et al., 2011). However, since there may be other causes of MCI, some people with it may not develop AD or experience worsening of symptoms, and, depending on the cause, may even recover from it (U.S. Department of Health and Human Services, 2011). Additionally, recent refinements in assessment and diagnosis of AD, such as advancements in brain imaging technology and genetic coding, have made the distinction of AD as a possible cause of MCI more apparent. Currently being better able to rule out AD, many potential AD diagnoses are being diagnosed as MCI since other causes are now more likely to be found (McKhann et al., 2011). Early differential diagnosis of the underlying cause of MCI is essential since it may reveal other potential health problems besides AD (e.g., stroke, severe depression) that may be treatable. Furthermore, if the underlying cause of MCI is discovered to be AD, early diagnosis would still allow for better planning of treatment before the disease progresses to its later stage and severely affects one's life.

The proposed refinement of the criteria for the diagnosis and stages of AD by NIH and in the DSM-5 would allow for much earlier and more precise diagnoses of AD to be made (Alzheimer's Association, 2012; Blazer, 2013; McKhann et al., 2011). This would allow individuals and their family members to be better prepared in advance for the physiological and psychological effects of the disease to come. NIH, working with Alzheimer's Association, proposed these changes mainly because of the outdated, currently used diagnostic criteria for AD are over 25 years old and early detection from biomarkers was not possible then (Alzheimer's Association, 2012). Much advancement in the detection and understanding of AD has been made during this time, and the new guidelines, and consequently the DSM-5 criteria, reflect this

(Blazer, 2013). However, since the guidelines largely rely on biomarkers and the technology to detect these are not yet sufficiently precise, more research, including the further refinement of biomarker detection instruments, is still necessary in order to properly implement the recently proposed guidelines from NIH for diagnosing AD (Jack et al., 2011; McKhann et al., 2011).

Treatment of Alzheimer's Disease

Treatment of AD in older adults focuses on the management of cognitive as well as physical symptoms in order to maintain the highest possible level of psychological, physical, and social functioning, in the face of the disabling effects of the illness. Treatment of AD usually includes medications, which can help slow the worsening of some symptoms of the disease; however, medications are not thought to slow down the progression of the disease itself (Alzheimer's Association, 2012). Because of the currently available medication's well-known limited efficacy in treating AD, many psychosocial interventions that provide cognitive stimulation or social engagement are usually also a part of treatment regimens. Furthermore, since people with AD will certainly experience the worsening of symptoms of the disease as it progresses no matter what treatments are utilized, caregiving is eventually an important and necessary part of treatment.

Caregiving

Caregiving is an essential component in the treatment process of persons with AD (Alzheimer's Association and National Alliance for Caregiving, 2004; Louderback, 2000). This can include, but is not limited to, helping the person with AD in his/her activities of daily living, such as eating and bathing, and managing behavioral symptoms of the disease (Louderback, 2000). While caregivers can be paid individuals unrelated to the person with AD, there is a growing population of almost 11 million family and friends providing an average of 863 hours of

home-based care each year to a loved one coping with the disease (Alzheimer's Association, 2011). About 60% of these caregivers are women, usually family members, and 30% of caregivers are also simultaneously caring for children at home (Alzheimer's Association, 2011; Alzheimer's Association and National Alliance for Caregiving, 2004). Although caregivers may report some positive aspects of caregiving, they also struggle with the immense burden associated with meeting the daily physical, psycho-social, emotional, and safety needs of their care recipients (Louderback, 2000; Schultz, et al., 2003; Vitaliano, Zhang, & Scanlan, 2003). In particular, caregivers of family members with AD often report struggling with the emotional strain and grief associated with watching the functional and expressive decline of a loved one, the stress of pending institutionalization for the care recipient, financial hardships, time constraints, and strained relationships (Alzheimer's Association, 2012; Louderback, 2000; Schultz, et al., 2003; Vitaliano, Zhang, & Scanlan, 2003). While the currently available treatments for AD, such as medications and psychosocial interventions, can help ease some of the burden on caregivers, their effect is limited.

Caregiver Burden. Research on caregiver burden has flourished in the last decade (e.g., Gitlin, Winter, Dennis, & Hauck, 2007; Hagerty, Martire, & Schulz, 2005; Herbert, Weinstein, Martire, & Schulz, 2006; Hilgeman et al., 2007; Rodriguez et al., 2003; Schultz et al., 2003; Spurlock, 2005; Vitaliano, Zhang, & Scanlan, 2003). In the context of AD, caregiver burden is conceptualized as the physical, emotional, social and financial hardships experienced by family or friends who provide care to an individual with the disease (Alzheimer's Association, 2011; Bedard, et al., 2001; Gupta, 1999). Specific types of burden include heightened emotional stress, social isolation, financial burden, and a decline in the caregiver's physical and mental health (Alzheimer's Association, 2011; Bedard, et al., 2001; Gupta, 1999). AD caregivers are much

more likely to report having less time for family, hobbies, vacations, and other leisure activities compared to non-caregivers of a similar age (Alzheimer's Association, 2011). In addition, almost fifteen percent of caregivers report experiencing a physical or mental health problem as a result of the stress of caregiving (Alzheimer's Association, 2011).

Because of the copious research done on caregiver burden recently, a good amount is known about what predicts high levels of it. Much of this research focuses on the functionality of the persons with the disease. One study on caregivers of people with dementia found significant correlations between caregiver burden and the dementia patients' ability to perform activities of daily living (ADLs; Razani, et al., 2007). That is, the less the persons with dementia were able to carry out their ADLs (e.g., grooming, eating, shopping, transportation needs, financial skills), the greater the reported burden levels in the caregivers. Consequently, caregivers who felt their time was most restricted reported the highest levels of burden. Another study that confirms the influence of ADL and time restraints on caregiver burden also found that the neuropsychiatric symptoms of AD (e.g., cognitive impairment, behavioral disturbance) were a strong predictor (Germain, et al., 2009).

While some studies of caregiver burden focus on the functionality of the care recipients, other studies have focused on aspects of the caregivers themselves, especially their mental health and well-being. For instance, one study on predicting AD caregiver burden found that a lack of social support among the caregivers and anxiety about their own aging predicted both perceived burden and depression (Hayslip, Han, & Anderson, 2008). While the lack of social support has been found as a predictor in other studies of caregiver burden (Donaldson & Burns, 1999; Germain, et al., 2009), other features of the caregivers are also known to influence burden as well. For example, caregivers' attitudes towards the recipients, along with the caregivers'

perception of their behavior (i.e., as deliberate rather than disease-related) were found to predict burden in one study (Donaldson & Burns, 1999). This same study also found that caregivers' gender and relationship to the care recipients were also influential in predicting caregiver burden.

Some prior studies have unexpectedly found that while perceived caregiver burden is reportedly high, caregivers also report high resilience and a positive impression of caregiving (Herbert et al., 2006; Hilgeman et al., 2003; Louderback, 2000; Wilks & Vonk, 2008). This positive impression of caregiving can include reminiscence of happy times, pleasurable activities done together, and having a deeper appreciation of the caregiver's and recipient's time together. Although positive and meaningful experiences are reported by some caregivers, other studies find that the negative effects of stress from caregiving can be overwhelming and can affect one's physical and mental well-being (Alzheimer's Association, 2009; Bar-David, 1999; Gupta, 1999; Rodriguez et al., 2003; Vitaliano, Zhang, & Scanlan, 2003). One study found that caregivers who employed more problem-focused coping strategies (i.e., feeling in-control of situations and therefore using strategies that focus on solving problems) had less depression than caregivers relying on emotion-focused coping (i.e., feeling a lack of, or little control over situations and therefore not attempting to solve problems, but rather focusing on emotions; Li, Seltzer, & Greenberg, 1999). Additionally, the caregivers utilizing problem-focused coping had reductions in depression over an 18-month period, while the caregivers using emotion-focused coping had increases in depression over the same period (Li et al., 1999). Utilizing supportive services designed to reduce caregiver burden can be an important method for caregivers to learn methods of coping and possibly avoiding the negative effects of caregiving.

Supportive Services for Caregivers. Most AD researchers would agree that services are necessary not only for the person with the disease, but for the caregiver as well. While some

recent AD caregiver research has focused on caregivers' well-being and mental health (Germain, et al., 2009; Hayslip, Han, & Anderson, 2008), public education on maintaining mental health and overall well-being for caregivers may also be of assistance. Many studies on caregiver burden have demonstrated its negative effects on health and well-being (Bar-David, 1999; Gupta, 1999; Hayslip, Han, & Anderson, 2008; Rodriguez et al., 2003; Vitaliano, Zhang, & Scanlan, 2003). While the need to care for the caregiver is becoming more well-known in the general public, psychoeducational classes for caregivers could adopt coping techniques and other methods of maintaining well-being in caregivers, and not merely focus on caring for persons with AD.

While many caregivers for individuals with AD are family members, paid caregivers can help assist with the treatment and are often utilized to provide much needed respite to the family members caring for the AD patient around the clock. Respite care was created to allow caregivers time away from taking care of family members and others with disabling illnesses such as AD, with the goal of helping the caregiver lower stress while still filling the needs of the individual receiving care (Alzheimer's Association, 2011; Alzheimer's Association and National Alliance for Caregiving, 2004). This can include 'day' programs that will care for the individual during the daytime hours, so as to allow the unpaid family caregivers to continue working throughout the day. This can be an important factor in the treatment of elderly persons with AD, while not completely disrupting the lives of their family members.

Another supportive service designed to reduce burden in AD caregivers is educational seminars and/or classes in which the caregivers can learn more about the disease and what changes to expect in the care recipient's cognition and behavior (Alzheimer's Association and National Alliance for Caregiving, 2004; Giltin et al., 2007; Hagerty, Martire, & Schulz, 2005).

These psychoeducational classes can also include caregiver training to teach potential caregivers how to know what needs to be done for their recipients. This can include going over the physical, psycho-social, emotional, and safety needs of care recipients and how caregivers can facilitate meeting them. Caregivers may be educated on helping the person with AD in his/her activities of daily living, such as eating, grooming, and cleaning, and also helping manage the behavioral symptoms of the disease (Bar-David, 1999; Giltin et al., 2007; Hagerty, Martire, & Schulz, 2005; Louderback, 2000; Parks & Novelli, 2005). These types of educational services for caregivers are usually offered free-of-charge by non-profit agencies such as regional branches (e.g., Alzheimer's Services of the Capital Area) overseen by national organizations such as Alzheimer's Association (Alzheimer's Association, 2012; Alzheimer's Association and National Alliance for Caregiving, 2004).

Lastly, AD caregiver burden can also be addressed through the utilization of support groups designed specifically for AD caregivers (Alzheimer's Association, 2011; National Alliance for Caregiving and the AARP, 2004; Louderback, 2000; Parks & Novelli, 2005). These are groups of unpaid, informal AD caregivers that will meet on a regular basis to discuss aspects of caregiving, and are usually facilitated by organizations such as Alzheimer's Association (Alzheimer's Association, 2011; Alzheimer's Association and National Alliance for Caregiving, 2004). Discussing the trials and tribulations associated with caregiving for someone with AD with others in similar situations can purportedly help buffer the stress and perceived burden in caregivers (Alzheimer's Association, 2009; National Alliance for Caregiving and the AARP, 2004; Louderback, 2000; Parks & Novelli, 2005). Like all support groups, members not only provide social support for one another, but they can also learn from each other such things as what to expect as the disease progresses, when to utilize other services, such as respite care, and

other comparable expertise to what can be learned in psychoeducational classes and seminars for caregivers.

Medications

Some existing medications for treating the symptoms of AD and other related dementias can slow down the worsening of some symptoms, especially declining cognitive functioning, although they are known to be restricted in their efficacy (Alzheimer's Association, 2012; Richter & Richter, 2004). Since these medications have demonstrated limited effectiveness, potential rehabilitation and treatment of the disease normally requires a multidisciplinary approach that uses non-drug interventions along with medications, if required (Richter & Richter, 2004; U.S. Department of Health and Human Services, 2010). Although there are specific medications known to somewhat improve both cognitive and behavioral functioning in some people with dementia, it is important to recognize the limited effectiveness and potential side effects of these drugs. Older people with dementia are far more likely to suffer from side effects from a drug because of normal neurochemical deficits that occur with advancing age (Richter & Richter, 2004; U.S. Department of Health and Human Services, 2010). Also, because of old age, those with AD usually suffer from other illnesses that may require additional medications that may interact with the drugs used to treat AD symptoms, or can even be the cause of dementia-like symptoms themselves (Richter & Richter, 2004). Since people with AD tend to respond variably to the different drugs currently used to treat dementia, it is important for physicians to find the right medication or combination of medications that minimize the side effects while maximizing the potential functioning in the patient and concurrently utilizing other forms of treatment besides medications.

Being the most popular treatment for AD, one would assume that drug therapies are the most efficacious for treating the disease; however, the aforementioned research (Alzheimer's Association, 2012; Chapman, et al., 2004; Richter & Richter, 2004) points out the limitations of the currently available drug therapies for AD and further advocate a multidisciplinary approach to its treatment. Although psychotropic medication is commonly used to treat agitation and aggressive behavior in this population, side effects of these medicines can often interfere with other symptoms of AD, and therefore are not desirable (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008). For example, the use of psychotropic medications to treat agitation or aggressive behavior in those with AD can further impair cognitive functioning; therefore, one or more other interventions are preferable if they are as effective (Chapman, et al., 2004). Physical restraints are also sometimes used in cases of physically aggressive behaviors, although these too can have negative consequences, and most would agree they should only be used in extreme cases (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008). While drug treatments or physical restraints may sometimes be necessary, a multi-disciplinary approach including cognitive stimulation and social engagement is considered best to maximize AD treatment regimen efficacy (Alzheimer's Association, 2012; Chapman, et al., 2004).

Psychosocial Interventions

Although medications are often considered the first line of treatment for AD and other related dementias, non-pharmacological approaches to treatment are also commonly utilized, even when medications are needed and used (Alzheimer's Association, 2012; Kasl-Godley & Gatz, 2000). This multidisciplinary approach is necessary because of the limited efficacy of each line of treatment that is currently available for AD. That is, each treatment usually targets only a

limited range of symptoms, such as music therapy used to decrease agitation (see Chapter 4 for further explanation; Sung & Chang, 2005; Witzke, et al., 2008). Non-pharmacological approaches to treatment usually employ some form of psychosocial intervention that may provide cognitive stimulation, social engagement, or simply something for a person with AD to focus on at the time, such as listening to prerecorded music. For example, listening to music is thought to provide a focal point which blocks out other distracting stimuli in the immediate environment, and consequently lowers the stress of having to process too much simultaneously (see Chapter 3 for further explanation; Gerdner, 1997, 2001; Spiro, 2010).

Many psychosocial interventions are done in group settings within day care centers for older adults or assisted-living facilities and nursing homes, and therefore may simultaneously provide cognitive stimulation while also enhancing social engagement. Some examples of this would be art and music therapy groups, community gardening, arts and crafts groups, memory training groups, and reminiscence therapy groups (Chapman, et al., 2004; Kasl-Godley & Gatz, 2000; Sung & Chang, 2005; Witzke, et al., 2008). While these group activities have demonstrated some efficacy in the treatment of AD, the underlying mechanisms for why these psychosocial interventions would work remains largely speculative (see Chapter 3 for possible explanations for why music therapy is effective for AD). One theory is that interventions and activities that are done in group settings provide social support, making the actual activity that is done less important than the meeting and socialization within the group (Kasl-Godley & Gatz, 2000).

Other interventions that may provide opportunities for socialization, such as support groups for people with AD, may also have positive effects on the distressing symptoms of AD (Kasl-Godley & Gatz, 2000). Support groups allow for the sharing of personal coping strategies

between its members, and therefore members may learn new methods that help them effectively deal with their symptoms. Additionally, therapies such as cognitive-behavioral training can also have a positive influence on behavioral symptoms of AD (Kasl-Godley & Gatz, 2000). Other therapies that are typical non-pharmacological approaches to AD treatment are interpersonal therapy, validation therapy, reminiscence therapy, and reality orientation (Douglas, James, & Ballard, 2004; Kasl-Godley & Gatz, 2000). Besides these common psychosocial approaches to the treatment of AD, myriad alternative therapies that have some evidence for their efficacy, including art and music therapy, have been applied to the treatment of AD symptoms (Douglas, James, & Ballard, 2004; Sung & Chang, 2005; Witzke, et al., 2008). It is important to explore the many available psychosocial intervention alternatives when planning an effective treatment regimen for AD since each individual is unique, and their response to different therapies will conceivably vary. Therefore individualized, multidisciplinary treatment regimens, including psychosocial interventions that provide cognitive stimulation and social support such as group music interventions, along with medications if necessary, would currently be the optimum treatment available for AD.

Policy Responses to Alzheimer's Disease Treatment

With the current treatment of AD focused on medical interventions along with caregiving and psychosocial interventions, some of the cost of treatment can be covered by Medicare and Medicaid policies. Medicare and Medicaid are programs designed for eligible elderly adults (i.e., 65 years of age and above), and low-income individuals and families to receive a variety of healthcare services from providers at little to no cost to them (LA DHH, 2009). Both Medicare and Medicaid are combined U.S. federal and state means-tested programs. Because they are joint programs between the federal government and each individual state, the way the programs are

run varies by state. Congress and the federal center for Medicaid and Medicare services set the main rules of the programs, but each individual state can decide exactly what services are funded. Although everyone age of 65 and over is eligible to receive Medicare health insurance supplements, the amount one receives is based on one's income, and this amount was reduced in 2007 with the implementation of rate cuts to Medicare Part B (LA DHH, 2008). Medicare Part B covers medical services vital to aging Americans - doctors' visits, tests, durable equipment and outpatient hospital care. Other parts of Medicare partly cover hospital stays and prescription drug costs and other services such as hospice care that are important to treatment of the older adult population in the U.S., including those with AD.

Hospice care cost is also covered by Medicare (i.e., except co-pay and other out-of-pocket expenses) when a person is diagnosed with a terminal illness and has 6 months or less left to live (U.S. DHH, 2010). Hospice care would provide management of pain and other symptoms of the terminal illness, and could also include counseling and other 'comfort care' to the individual and family members. This can include people in the final stage of AD. Guidelines based on the progression of dementias, including AD, are available to help determine when a dementia patient may only have 6 months left to live in order to qualify for Medicare coverage of hospice care. Like other services available to treat AD, such as caregiving, hospice care can be received in the individual's home, at an independent facility, in a hospital, or in a nursing home.

Caregiving is also an important aspect in the treatment of persons with AD, and is also covered in part by Medicare and Medicaid. While many caregivers for individuals with AD are family members, paid caregivers can help assist with the treatment and are often utilized to provide much needed respite to the family members caring for the AD patient around the clock. Respite care was created to allow caregivers time away from taking care of family members and

others with disabling illnesses such as AD, with the goal of helping the caregiver lower stress while still filling the needs of the individual receiving care (Alzheimer's Association, 2012). Part A of Medicare's policy covers respite care when a person requires 24 hour, continuous live-in care (U.S. DHH, 2010). Respite care can be provided in-home or out-of-home, where family members can leave their loved-one with AD in the care of a paid caregiver for short periods. This treatment coverage by Medicare can be an important factor in the treatment of older adults with AD.

It is important to note, however, that there are a large number of people with AD that are below the age of 65, and therefore are not eligible to receive Medicare coverage for treatment. It is estimated that this number is 500,000 people under age 65 who currently have AD and other dementias (Alzheimer's Association, 2011). This population of AD sufferers under age 65 may receive Medicaid coverage, although they must meet multiple criteria for eligibility. Being poor- even being very poor- does not automatically make someone eligible to receive Medicaid funding for healthcare services. Research done by DHH (2008) in Louisiana estimates that approximately 60% of Louisiana's poor do not have medical health insurance and are not covered by Medicaid because they are not eligible. It is a means-tested program, though other requirements besides being poor are needed to be eligible for Medicaid. Some of these requirements are being over 64 years old (i.e., qualifies one for Medicare), pregnant women, families having children under 19 years old, being physically or mentally disabled in some way, and having little or no medical health insurance. The requirement of 'mental disability' is not a feature at the beginning stages of AD, and therefore someone with the disease under the age of 65 would not be eligible for Medicaid coverage of treatment, even though treating the disease early on can slow down the progression of symptoms (Livingston & Katona, 2004; Richter &

Richter, 2004). In addition, Medicare will sometimes not cover the costs of treatments if they are misinterpreted as not being beneficial to the person (National Association of Social Workers [NASW], 2000). This means that access to rehabilitative and psychotherapeutic services may be denied because of an AD diagnosis. This policy is based on the misguided idea that no one with AD or other dementias could benefit from these services. According to the NASW (2000), a superior policy would be one based on individualized determination of treatment, such as the premise that while some people with AD indeed would not benefit from these services, others can. These limitations of the Medicare and Medicaid programs, along with their limited coverage, may prevent many with AD from receiving proper treatment if they have no health insurance of their own.

A comprehensive examination of AD-related policy would need to address myriad issues regarding the delivery and financing of care for those who now have AD, and for the hundreds of thousands of people who will become AD patients as the population ages. Such an undertaking is beyond the scope of this research and the resources available to this author. However, because Medicare and Medicaid laws vary by state, each state's laws can have a dramatic effect, for example, on whether a patient with AD can get needed services in the community instead of in a nursing home, a younger person with early-onset mild AD can get treatment at all, or someone whose genes put the person at a higher risk of future AD can buy private long-term care insurance. While Medicare coverage does include many aspects of AD treatment, it is not all-inclusive and usually does not cover services in full. Furthermore, recent cuts to Medicare and Medicaid mean greater out-of-pocket expenses for doctor visits and medications even when one is covered. The implementation of Medicare and Medicaid policy changes and other policy matters could make a real difference in the lives of AD patients and their families, especially

through service accessibility. For example, whether respite services are covered by Medicare and Medicaid policy influences the availability of psychosocial interventions such as music therapy for people with AD, which also possibly reduces the burden on their caregivers. Because the burden associated with caring for someone with AD can have a harmful impact on one's health, the implementation of policies relating to early detection and appropriate interventions for caregivers and AD sufferers could improve their well-being and potentially stave off both mental and physical illness.

Summary

The increasing life expectancy of persons living today has resulted in remarkable growth in research of the consequential diseases related to aging such as AD (Alzheimer's Association, 2012). AD is among the most common and costly conditions associated with aging. It afflicts more women with a family history of the disease more often than those without immediate relatives with AD, although it can strike anyone since the main risk factor associated with developing the disease is advancing age. However, the risk-factor research discussed here demonstrates that most individuals do have some control over the risk of developing the disease and its symptomology. Protective mechanisms include lifestyle and dietary factors, which are easily modifiable; however, they have shown only minor influence on the risk of developing AD. Preventing older adults from developing AD, or at least keeping its symptoms at bay, extends their independent functioning, which, in turn, reduces the caregiver's load in assisting them.

Current research on AD, while still ongoing, has revealed a greater depth of understanding, largely due to advancements in technology. One main area of advancement is in brain imaging which allows the displaying of the accumulation of plaques and areas of dysfunction within the brain (National Institute on Aging & National Institutes of Health, 2011).

Additionally, a number of genetic influences have been identified as playing a role in acquiring AD, although acquiring the disease is not inevitable when carrying these genes in the majority of instances (Alzheimer's Association, 2012). Progression of AD has been defined by three stages that are currently in widespread use for diagnosis (Alzheimer's Association, 2012). These stages help define the progressive worsening of symptoms of the disease. However, NIH proposed changes to the stages and diagnostic criteria for AD, due to advancements in the detection of biomarkers (Jack et al., 2011; McKhann et al., 2011). The current diagnostic criteria allow for earlier diagnoses to be made, and therefore may allow people with AD and their families to be better prepared for the devastating effects of AD. The multidisciplinary approach to AD treatment necessitates complexity and individuality in treatment regimens. Although this chapter is not comprehensive, it does discuss a number of AD-related issues that help determine the diagnostic criteria and symptomology of the disease, the environment in which treatment is given, how and what AD care is delivered, and how treatment may be funded.

CHAPTER 3: THEORIES OF MUSIC'S EFFECTS ON EMOTION AND BEHAVIOR

Every culture on earth includes some form of music (Cross & Morley, 2008; Levitin & Tirovolas, 2009). Even some animals engage in song (e.g., birds) or other rhythmic activities (e.g., primates hitting rocks together), or vocalizations at specific pitches (e.g., dogs howling). Musicologists that study its evolution believe that music may exist today because it has selective beneficial effects in humans, including the ability to convey and modulate emotion (Cross & Morley, 2008; Levitin & Tirovolas, 2009). This chapter will discuss the evolution of music, theories of music as a means of communicating emotions, theoretical explanations for music's effects on emotion, music's role in memory, and various models of therapeutic uses for music, including explanations for why it is being used in the treatment of AD.

Evolution of Music

One prominent focus in recent musicology research has been on studying the origins of music (Cross & Morley, 2008; Levitin & Tirovolas, 2009). This area of research questions why music might have evolved, why it continues to play a role in modern society, and what roles it may play. Examining music from an evolutionary perspective, some musicology researchers believe that music developed and remains a part of every culture because it has selective benefits (Cross & Morley, 2008). Others, however, consider music to be nothing more than a byproduct of the evolution of human language and that any pleasure obtained from listening to or playing music is incidental (i.e., the “auditory cheesecake” theory; Pinker, 1997, cited in Levitin & Tirovolas, 2009). The hypothesized benefits of our ancestors playing music include increasing cognitive and emotional flexibility, and physical fitness and motor coordination, since dance or movement usually accompanied music making (Levitin & Tirovolas, 2009).

Because music is thought to be capable of transmitting emotional information to many people simultaneously, it is hypothesized to have increased group cohesion by modulating the emotions of the group members (Blacking, 1969, cited in Cross & Morley, 2008). This is believed to have been advantageous to our ancient ancestors since group cohesiveness likely increased cooperation with other group behaviors, something that is beneficial to the survival of the group. Another theory states that music may have evolved from mother-infant communication, and that its primary function was to convey speech and other communicative information from mother to infant and consequently act to strengthen the bond between them (Roederer, 1984, cited in Cross & Morley, 2008). This possibility and other views of music serving as mechanisms of communication are widely popular among musicologists.

Music as Communication

It has been proposed over a hundred years ago that music may have its origins in a musical proto-language (i.e., a primitive form of language consisting of distinct rhythmic, tonal calls; Darwin, 1871/1998). That is, music as a form of communication is believed to have evolved either before, or simultaneously with, spoken language in humans. Many great thinkers of the past, from Descartes to Darwin to Nietzsche, have considered the origins of music and language to have some association. One musicologist has even proposed that music and language may have evolved concurrently as a single communication system that he coined ‘musilanguage’ (Brown, 2000, cited in Cross & Morley, 2008). The musilanguage theory is well-accepted by many musicologists, although some believe that music preceded language, and others that language preceded music (Cross & Morley, 2008; Levitin & Tirovolas, 2009). While a full review of the connection between music and language is beyond the scope of this work, it is

important to note that this link exists and that it specifically plays a role in the communication of emotion.

The proto-language, or musilanguage, of our ancient ancestors is theorized to have consisted of pitch and timbral-varying, rhythmic calls that were used to express various emotions (Cross & Morley, 2008). It is believed that the different primal calls were distinct enough to convey specific emotional content. This transmission of affective information is thought to be a key element of musilanguage since the expression of emotions was essential to survival. For example, when a predator may have been approaching, fear needed to be expressed to warn others and prevent them from being harmed. However, musicologists that study language and music consider music and musilanguage communication to be more ambiguous in their meanings than spoken words (Cross & Morley, 2008). Although these primitive calls were a language in itself, they eventually developed into the more complex communication system of speech because of the need for greater stability in the meanings of messages.

Musicologists that study the evolution of music point out the evidence for the musilanguage theory in that the characteristics of speech, such as rhythm, pitch, and phrasing, are very similar to those of music (Cross & Morley, 2008; Levitin & Tirovolas, 2009). However, two differences between music and spoken language are notable. One is the aforementioned ambiguity in the meanings of music, and the other is that music usually allows and encourages participants to act simultaneously, whereas speech communication is normally done consecutively, alternating between those involved (Cross & Morley, 2008). Regardless of these differences, the aforementioned acoustic qualities of speech have been found to change with the emotional state of a person, demonstrating that the nonverbal part of speech remains an important component of expressing emotion and relaying affective information beyond the

words spoken (Juslin & Västfjäll, 2008; Levitin & Tirovolas, 2009). This is posited to indicate that musicality may have evolved primarily as a means to express and induce emotion. Using music for communicating emotion is a common use of music therapy when utilized with people with autism spectrum disorders (Gold & Wigram, 2007; Whipple, 2004). Persons with dementia in later stages of the disease normally will lose the ability to communicate using coherent speech (Alzheimer's Association, 2012); therefore music may also provide a potential means of communicating emotions in this population.

Music and Emotion

The conveyance of emotions and other affective information is considered a primary function of music by many musicology researchers that specialize in perception of music (Juslin & Västfjäll, 2008; Levitin & Tirovolas, 2009). This area of research has also demonstrated that people today mainly value music for the emotions it is capable of evoking in listeners, and emotional regulation has been commonly reported as the main reason for listening to music in prior studies (Juslin & Västfjäll, 2008). People have reported listening to music specifically to change, release, or match their current emotional states in order to enjoy or comfort themselves, or in order to relieve stress. Listening to classical music has also been found to produce strong emotional responses along with biophysical changes (e.g., chills, shivers, changes in heart rate) in listeners (Levitin & Tirovolas, 2009). Music listeners' responses, including the biophysical responses related to emotion, have been an area of intense focus for much of musicology research in the area of perception and cognition. However, Juslin and Västfjäll (2008) state that there is yet to be a satisfactory explanation of the underlying mechanisms for music's effects on emotion. While biophysiological responses to music have been studied extensively, they are only considered characteristics or indicators of emotions, and not the emotions themselves.

Cognitive Processing of Emotions

Many prior neuro-imaging studies have revealed that the limbic system is primarily involved in the generation, detection, maintenance, regulation, and termination of all emotions in humans (Koelsch, 2010). While music-related emotion is accepted as being processed primarily within the limbic system of the human brain, this area is not well-defined in mammals (Juslin & Vastfjall, 2008; Levitin & Tirovolas, 2009). The mammalian limbic system is believed to have evolved differently in different species (Reep, Finlay, & Darlington, 2007). For example, while some lower species' limbic systems may be dominated by olfaction (e.g., dogs), higher species, such as the primate and human limbic systems have evolved to be more dependent on visual and auditory systems (Reep et al., 2007). This means that the interconnections and potential parts of the limbic system are different among different mammalian species. Additionally, not all neurologists agree on what parts of the brain make up the limbic system even within a species (Juslin & Vastfjall, 2008; Levitin & Tirovolas, 2009). That is, even in humans, the limbic system is defined differently, containing dissimilar parts of the brain, some not agreed on among neurological researchers.

However, one featured part of the limbic system of all mammals is the amygdala, which is known for its role in the processing and generation of emotions, especially those considered essential to survival, such as fear (Brattico et al., 2011; Koelsch, 2010). The amygdala has been implicated in research on intensely pleasurable responses to music, such as chills and shivers down the spine, which prior neuro-imaging studies having demonstrated a deactivation within this region during these events (Koelsch, 2010; Levitin & Tirovolas, 2009). One possible reason for this is that the amygdala is strongly associated with negative emotions such as fear and anxiety, and therefore deactivation of this region may decrease the autonomic, fight-or-flight

arousal associated with it and allowed the pleasurable responses to music to occur. Besides pleasurable experiences, the deactivation of the amygdala, along with other biophysiological responses, are postulated to play a role in the therapeutic effects of music, including reducing stress and anxiety (Koelsch, 2009).

Biophysiological Effects of Music

Research on the biophysical effects of music has focused on changes in both physical characteristics (e.g., heart rate, respiration, skin conductance) and the neural processing of music within a variety of regions in the brain. Neuro-imaging technology has demonstrated activation in several distinct brain regions when either listening to or playing music. It has been well-established that the processing of music-related emotions is done in sub-cortical regions of the limbic system in the brains of music listeners (Brattico et al., 2011; Levitin & Tirovolas, 2009). Because music affects the limbic system, it is considered an appropriate tool for studying the changes in the brain associated with emotions. However, only a few studies have examined correlations of emotions induced by music and brain region activation thus far (Brattico et al., 2011). Advances in neural-imaging technology (e.g., fMRI) have made this research possible, although their use is not widely available to researchers. Additionally, it is important to note that while the limbic system does play an important role related to music and emotions, other exterior brain regions have also been found to interact with the limbic system during emotional responses (Levitin & Tirovolas, 2009).

Past researchers have hypothesized that music was processed primarily in the right brain because of its emotional content, while speech was processed in the left side (Levitin & Tirovolas, 2009). Advances in neuro-imaging technology have more recently shown that areas of both sides are activated when processing music and emotion, since emotion-related circuits are

located throughout the brain and music can induce such a wide range of both simple and complex emotions. However, other aspects of music have been shown to be processed within different, specific regions localized to specific areas of the brain (Brattico et al., 2011; Levitin & Tirovolas, 2009). For example, the perception of pitch and melody (i.e., patterns of pitch) primarily activate the right hemisphere while rhythm and semantic information (i.e., recognition of intervals, identification of familiar melodies) activate the left. Although the identification of familiar melodies was found to activate the left hemisphere in the brain, reproduction of those melodies (i.e., asking someone to play or sing the melody) was shown to primarily be done using the right side (Andrade & Bhattacharya, 2003). Fine distinctions such as these make it difficult to precisely conceptualize the functions of different characteristics of music within the brain.

Many aspects of music are closely-related, as in the previous example of melody, and therefore cannot easily be isolated. For this reason, and because multiple areas of the brain are usually involved in processing any feature of music, modern musicologists consider the hemisphere explanation an oversimplification (Brattico et al., 2011; Levitin & Tirovolas, 2009; Koelsch, 2010). For instance, the processing of a familiar melody may not be able to be isolated from the emotional response of the listener, and since emotional processing takes place throughout the limbic system of the brain, it may be impossible to pinpoint exact regions of processing for such a specific aspect of music. However, most musicologists that study cognition agree that music processing is done in a modular manner, utilizing different areas for processing different characteristics of music. Some evidence for this comes from prior studies showing greater brain activation while listening to music in people with musical training than those without musical backgrounds (Lowis, 2010). It is believed that people with musical ability tend to listen to music more analytically and thus activate more regions within the brain when doing

so than people without any musical training. This deeper, analytical listening was also found to increase the intensity of emotional responses to music, which may be due to the greater activation within the brain (Lowis, 2010).

One study of music's effects on people with dementia demonstrated that the type of dementia influenced the emotional recognition of various pieces of music (Omar, Hailstone, Warren, Crutch & Warren, 2010). This study included two participants who had backgrounds with musical training and also had a clinical diagnosis of dementia. Their results were compared with a normal population of cognitively-healthy musicians as a control. One participant had been diagnosed with semantic dementia, and showed severely restricted emotional recognition of music, while the other participant had AD and demonstrated a normal recognition of the emotional content of music (Omar et al., 2010). The participants differed on recognizing other aspects of music as well, with the participant with semantic dementia showing preserved recognition for musical objects (e.g., compositions), and symbols (e.g., music notation), while music sources (e.g., different instruments, timbre) and emotions were impaired (Omar et al., 2010). Interestingly, the participant with AD demonstrated preserved emotional recognition of pieces of music and recognition of music sources, while recognition of musical objects and symbols were found to be impaired. This suggests that different areas of the brain are activated during the recognition of each of these dissimilar aspects of music. Furthermore, the finding that emotional recognition of music is preserved in AD strengthens the case for its utility to modulate emotion in people with the disease. While biophysiological responses to music add credence to the evidence for the efficacy of music therapy in reducing stress and anxiety, other psychosocial explanations for music's effects that go beyond physiology have also been posited (Koelsch, 2009; Lowis, 2010).

Psychosocial Theories for Music's Effects on Emotion

Personal feelings and subjective experiences have been considered an essential component of emotion since the time of Aristotle (cited in Lundqvist, Carlsson, Hilmersson, & Juslin, 2009). Regardless of years of continuing biophysiological research on music's effects on emotions, musicologists believe that the changes within the brain and body found when listening to music do not truly or totally represent the emotional effects of music or what emotions actually are (Juslin & Vastfjall, 2008; Koelsch, 2009; Lowis, 2010). Some musicologists believe that the application of the scientific method to such personal, subjective experiences as emotional responses to music will never provide sufficient information as to how they work (Lowis, 2010). There is not even absolute agreement among musicologists and other researchers of emotions regarding the conceptualization of emotion itself (Lundqvist et al., 2009). Thus, musicologists have often relied on self-report in addition to biophysical changes in an attempt to more accurately understand the subjective, emotional experiences of music listeners.

Many musicologists believe that biophysiological responses, such as autonomic arousal, are not necessary in order for music listeners to feel emotion (Johnsen, Tranel, Lutgendorf, & Adolphs, 2009). That is, listeners can feel and describe an emotional response to music without any biophysical indication that a reaction has occurred. There is also evidence for a dissociation between the cognitive processing of music and emotional responses. Prior studies of people with brain lesions in areas within the limbic system that are associated with emotion have demonstrated the preservation of the cognitive processing of music, but have not displayed emotional responses to music (Matthews, May, Chang, Engstrom, & Miller, 2009). The converse has also been found to be true, where severe deficits were found in the cognitive processing of music, but strong emotional responses were still reported. This dissociation has been found in

case studies of people with generalized auditory agnosia (i.e., impaired interpretation of sounds; Matthews et al., 2009), and AD (Omar et al., 2010). This preservation of emotional recognition and reactions found along with deficits in cognitive processing or autonomic arousal from music highlight that other pathways are probably involved in emotions related to music. Additionally, this emphasizes that music remains a viable method for the communication of emotion in people with cognitive impairment, such as those with AD, who may not show normal biophysiological responses to music.

There is no one mechanism that is likely to fully explain the effects of music on emotions. Therefore, several theories, including some not involving biophysical responses, have been posited as to how music may induce and modulate emotions in its listeners. Some of these theories involve: brain stem reflexes, evaluative conditioning, emotional contagion, mental imagery, episodic memory, and musical expectancy (Juslin & Västfjäll, 2008). Juslin and Västfjäll (2008) attempted to combine these disparate theories into a complete, theoretical framework for music's effects on emotion. However, few of these theories or the framework in its entirety have been empirically tested. Some of the individual theories will be briefly discussed for their relevance to music therapy.

Evaluative conditioning refers to the pairing of a piece of music to other concurrent stimuli, either positive or negative (Juslin & Västfjäll, 2008). Pairing of the music with a positive stimulus, such as repeatedly hearing a piece of music during each occurrence of a happy event (e.g., hearing someone's favorite song that you enjoy being with), may condition the listener to later produce a positive response to the music alone. This can transpire without awareness of its occurrence, and is posited to be a powerful regulator of emotion that may be responsible for many of the emotional reactions to music in everyday life (Juslin & Västfjäll, 2008). Evaluative

conditioning is relevant to music therapy because it suggests that familiar music associated with positive emotions in the past could be utilized in sessions in order to stimulate current positive responses. It is important to note that this mechanism is different from that of episodic memory (discussed in Music and Memory below), since pieces of music are paired with emotions and not past memories in this instance.

Emotional contagion refers to listeners emulating the emotional content conveyed in the musical work itself (Juslin & Västfjäll, 2008). It is generally acknowledged that music in a major key portrays happy emotions, while music in a minor key portrays sad emotions. Lyrics can also contribute to the emotional content of non-instrumental musical works. For example, hearing a song with sad content, whether lyrical or instrumental, may be recognized and consequently induce a feeling of sadness in a listener. This mimicking of emotion is the basic, most direct mechanism of how music may affect emotion, and has been demonstrated in many prior studies (Juslin & Västfjäll, 2008; Koelsch, 2009). Implications for music therapy suggest including relevant songs with the emotional content wished to be conveyed and evoked in participants during sessions.

Mental imagery theory postulates that emotions are induced in music listeners through the invoking of visual imagery from the music (Juslin & Västfjäll, 2008). For example, a slow, peaceful song may evoke pleasant, peaceful imagery in listeners, which is partially responsible for the resultant peaceful feelings from the music. This suggests utilizing only pleasant and calm songs for therapeutic use if the goal is to reduce agitation, stress, or anxiety, while up-tempo, happy musical numbers may be utilized for depression to induce arousal levels by evoking lively mental imagery. Music therapists that work with individuals may ask their clients what they imagine with certain pieces and how it makes them feel, and then continue to utilize the most

effective pieces since music therapy's effectiveness is likely due to many different underlying mechanisms (Koelsch, 2009). While emotional regulation plays a primary role in music therapy, memories of past events may partially explain this phenomenon.

Music and Memory

Music and memory are thought to interrelate in numerous ways. However, memory for music, including the ability to play instruments, recognition of familiar pieces, and perception of various aspects of music, are sometimes found to be preserved in people who otherwise demonstrate severe deficits in other areas of memory (Cuddy & Duffin, 2005; Omar et al., 2010; Swartz, Hantz, Crummer, Walton, & Frisina, 1989). One specific example is with people with AD. Several studies indicate that people with AD, even when in the late stage, can recognize and respond to familiar pieces of music, and a few studies have even demonstrated that some musical abilities, including the ability to play previously memorized pieces, is also spared in AD (Cuddy & Duffin, 2005; Gerdner, 1997; Omar et al., 2010; Swartz et al., 1989). One reason for this may be because playing previously memorized pieces of music does not rely on declarative memory (i.e., memory of explicit, articulatable knowledge), but on implicit, procedural memory (Omar et al., 2010; Swartz et al., 1989). Procedural memory is memorized knowledge of how to carry out procedures, usually involving motor movement, and is usually relatively spared in AD. This means that someone with AD who may be able to play previously learned musical works may not be able to articulate the knowledge about the piece (Cuddy & Duffin, 2005; Swartz et al., 1989). This suggests that the implicit, procedural memory responsible for making music and the emotional and other responses to music are separate from explicit, declarative memory.

AD primarily affects declarative memory in all of its stages; however, memories of distant past events (e.g., episodic or autobiographical memories) are usually spared during the

initial stages (Alzheimer's Association, 2012). Since the music people favor in their teens and early 20's is usually the music they prefer for life (Bruhn, 2002; Schafer & Sedlmeier, 2009), any autobiographical memories associated with familiar music in people with AD should normally be intact in the early stages of the disease. Music therapy with people with AD (discussed in depth later), takes this into consideration and normally utilizes familiar music from the time when the person was an adolescent to young adult (Gerdner, 1997, 2001). However, even people with late-stage AD who show severe deficits in autobiographical and episodic memories can continue to respond normally to music, including with the regulation of emotion (Cuddy & Duffin, 2005; Gerdner, 1997; Omar et al., 2010). Additionally, even when other declarative knowledge is not able to be articulated well, people with AD demonstrate an uncharacteristic ability to recall and recite lyrics along with a melody normally (Carruth, 1997; Gerdner, 1997, 2001). This preservation of musical memory and responses to music in people with AD has led to its widespread use in therapeutic situations, not only to regulate emotion, but also to facilitate communication and autobiographical memory.

Autobiographical memories are sometimes strongly associated with specific pieces of music (Bruhn, 2002; Juslin & Vastfjall, 2008; Omar et al., 2010). Autobiographical memories that are most commonly reported as being associated with music are social events, including with romantic partners (e.g., "They're playing our song"), events with friends (e.g., music concerts), or other events such as vacations, movies, sporting events, or the birth or death of a loved one. Any event in which music may have been present can become an autobiographical memory associated with the specific music, whether positive or negative. For example, if someone who has been in a car accident while a particular song was playing on the car radio, he or she may become anxious when hearing the song at a later time because of the recalled

memory of the accident. This is one reason why it is important to individualize the music utilized in music therapy, which would typically include familiar music, but probably not include songs that may be associated with traumatic events.

The use of familiar pieces of music in music therapy is hypothesized to facilitate the recall of autobiographical memories, and consequently to help regulate emotions. Music is known to facilitate memory recall, especially of episodic and autobiographical memories (Foster & Valentine, 1998; Irish, 2006; Clark, Lipe & Bilbrey, 1998). When autobiographical memories are brought to mind, the emotions associated with those memories are also thought to be re-experienced (Juslin & Västfjäll, 2008; Pereira et al., 2011). It is posited that this may be due to the physiological reactions to the original experiences being stored in memory along with any other additional information making up the memories (Lang, 1979, cited in Juslin & Västfjäll, 2008). These reactions are then later recalled with the memories as well. While studies have demonstrated biophysiological reactions to recalling autobiographical memories, it is important to point out that some researchers believe that these biophysiological responses are not emotions themselves, and that they are not even necessary for people to feel or experience emotion subjectively (Johnsen et al., 2009). Nevertheless, many people report using music to remind them of pleasant events in their past in order to re-experience the associated emotions and improve mood (Juslin & Västfjäll, 2008; Pereira et al., 2011). This can be especially valuable in people with AD who may otherwise not be able to recall these events.

The loss of one's autobiographical memories that occurs with AD and other related dementias is essentially the loss of one's self-identity (Caddell & Clare, 2011; Kasl-Godley & Gatz, 2000). Therefore any interventions facilitating the recall of one's past experiences, such as reminiscence therapy, may help one maintain a sense of self while facing the disabling effects of

diseases such as AD. Autobiographical recall has specifically been shown to be improved in people with dementia while listening to music than without listening to music (Foster & Valentine, 1998; Irish, 2006; Clark et al., 1998; Sacks, 2008). Clark and colleagues (1998), Sacks (2008), and many others have witnessed older people with AD and other related dementias who are ordinarily nearly completely withdrawn become highly sociable, sharing lengthy, detailed stories, after listening to their favorite music from their youth. This recall of distant-past life events is thought to facilitate emotional responses that are commonly experienced to familiar pieces of music in people with AD and other dementias (Koelsch, 2001; Clark et al., 1998; Sacks, 2008).

This possible connection of music and autobiographical memory demonstrates the utility of music in therapeutic settings for people with AD. For example, Foster and Valentine (1998) suggest playing music in the background when interviewing people with AD about their lives in order to improve the flow and accuracy of the information received. Another potential therapeutic use of music aiding the recall of pleasant, past memories is to help people with AD adjust to living in a nursing home or other long-term care facility (Koelsch, 2001). For instance, helping new residents of a nursing home to recall their pleasant life events can help to reduce the anxiety of adjusting to the new situation. Music is also often utilized in reminiscence therapy in order to aid in the recall of pleasant experiences along with the positive emotions associated with them (Caddell & Clare, 2011; Kasl-Godley & Gatz, 2000). However, even when music is used as a solitary mode of therapy, without the intentional recall of autobiographical memories, it can have positive effects on people with AD or other disorders.

Music and Stress Threshold in Alzheimer's Disease

One of the most prominent features of the use of music for treating the symptoms of AD and other dementias has been its efficacy in reducing agitation and related anxious feelings and behaviors (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke, et al., 2008). While many studies have found the effect of reduced agitation, few have examined the underlying mechanisms or postulated theories for the phenomenon (Gerdner, 1997; Spiro, 2010). However, an extensive search of the literature regarding the use of music as an intervention for dementia revealed one underlying theory posited by Gerdner (1997), who posits a mid-range theory on music's effects on stress and agitation in people with dementia or other cognitive impairment. The cognitive impairment found in dementia and other similar conditions is hypothesized to lower one's stress threshold for environmental stimuli, creating greater stress levels and making one more prone to agitation when presented with multiple, concurrent stimuli. Having and continuing to develop a lower stress threshold when cognitively impaired means that people with dementia are more easily stressed under less of a load of stimuli in their environments than those who are not cognitively impaired (Hall & Buckwalter, 1987; Gerdner, 1997).

Since cognition continues to decline with the advancement of AD, Hall and Buckwalter (1987) have identified the resultant increasing stress reaction to environmental stimuli in people with AD as the *Progressively Lowered Stress Threshold (PLST)*. This theory, based on aging and stress research in animal models, posits that as the brain ages, it becomes less resilient to stress, which may further accelerate cognitive decline since stress is known to cause degenerative changes within the brain (U.S. Department of Health and Human Services, 2011). The PLST theory (Hall & Buckwalter, 1987) suggests that people with AD are more prone to the effects of

stress, and studies on persons with AD have found high levels of some hormones, especially stress hormones (e.g., cortisol) in participants (U.S. Department of Health and Human Services, 2011). Aging itself seems to reduce the brain's ability to stop the production of stress hormones since levels typically increase with age, with or without the presence of AD (Richter & Richter, 2004). Stress hormones are known to increase inflammation in the body and brain, and high levels of inflammation are also associated with having AD (Alzheimer's Association, 2012; U.S. Department of Health and Human Services, 2011). In her model based on the PLST, Gerdner (1997) proposes that familiar music acts as a central focal point for people with dementia to attend to in their environment, and consequently reduce the stress of trying to comprehend other concurrent multiple sources of stimuli. Consequently, the lowered stress leads to less agitation and fewer disruptive behaviors. While many prior studies have demonstrated music's ability to reduce agitation in people with AD, few have explicitly attempted to test this model in an empirical approach.

Conclusion

Several theoretical mechanisms that help explain music's effects on us, based on both biophysiological and psychosocial reactions to music, were discussed. Emphasis was given to the emotional responses of music in people with AD, since this is the author's intended area and population of study. Spiro (2010), searching for the underlying mechanisms for music's effect on the regulation of emotion and autobiographical memories in people with AD, identified some possible roles of music therapy when utilized with this population. The music therapy roles he identified included: 1) as a leisure activity which contributes to wellbeing; 2) as an intervention showing positive effects on memory and communication; and 3) as an intervention affecting one's state of mind and behavior (e.g., agitation, anxiety and stress, disruptive behaviors; Spiro,

2010). Theoretically, the aforementioned increased recall of pleasant autobiographical memories contributes to all three of these roles of music in people with AD. However, other underlying mechanisms, as also previously discussed, are probably also partially responsible for music's effects on people with AD. The identification of these roles of music therapy, however, does help elucidate possible theoretical approaches applicable to the uses of music with people with AD and related dementias.

CHAPTER 4: REVIEW OF MUSIC THERAPY LITERATURE

The purpose of this literature review is to examine relevant research on music interventions and their effect of decreasing agitation found in people with AD or other similar dementias. Agitation and the resultant behaviors in people with dementia are frequently reported by caregivers to be the most challenging aspect of their duties (Sung & Chang, 2005; Witzke et al., 2008). If left uncontrolled, agitated behavior in dementia sufferers can put one at risk of harm to themselves, their caregivers, or others, since these behaviors can often lead to aggressiveness and destructive acts (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sung & Chang, 2005; Witzke et al., 2008). Reducing the agitation and related behaviors associated with dementia improves the quality of life of both the persons with dementia and those around them, and music therapy and other music interventions can help facilitate this process.

This chapter explores research related to the use of music therapy and music interventions as a potential treatment for symptoms of AD. First, this chapter conceptualizes music therapy by exploring various definitions and types, including the methods and techniques that are commonly used in treatment. The use of music for treating symptoms of autism spectrum disorders, for pain management, and in neuro-rehabilitation are also briefly discussed in order to give the reader a broader sense of how music can be used therapeutically. A discussion of relevant literature specific to the use of music for treating symptoms of AD then follows. Finally, this chapter discusses prior studies on the use of music as an intervention specific for agitation in people with AD and the limitations of this body of knowledge.

Conceptualization of Music Therapy

Music therapy can be thought of as any use of music by a qualified music therapist that provides a therapeutic benefit to a client or group (Bruscia, 1998; Darnley-Smith & Patey, 2003;

Peters, 2000). While this simple, yet broad definition encompasses what music therapy is, many other more specific definitions have been posited, which identify distinct types and certain techniques in which music can be used for therapeutic purposes. However, all forms of music therapy aim to create a secure, stimulating environment, meet social and emotional needs, increase attention and quality of life, and regulate the arousal level of clients receiving it (Bruscia, 1998; Darnley-Smith & Patey, 2003; Peters, 2000). Music therapy has been shown to improve both the mental and physical health of participants in prior studies (Koelsch, 2009). The underlying mechanisms that are thought to contribute to music therapy's effects, while not fully understood, are believed to modulate emotion, attention, cognition, behavior, and communication (Koelsch, 2009). Additionally, involvement with music throughout life is believed to contribute to increased brain plasticity, even when music is not learned until late in life (Bruhn, 2002; Wan & Schlaug, 2010). Two broad categories of music therapy are *active*, in which recipients actively participate in the creation of music during sessions, and *passive*, where recipients simply listen to prerecorded music (Darnley-Smith & Patey, 2003; Peters, 2000). Both broad categories of music therapy, along with related treatment models, are discussed further below.

Active Music Therapy

Active forms of music therapy involve the music therapist and the recipient engaging in the creation of music during sessions (Darnley-Smith & Patey, 2003; Peters, 2000). For example, the music therapist may play familiar songs and encourages recipients to sing along or clap. Simple instruments may also be used, such as shakers and hand drums. Recipients with musical skill may utilize more complex instruments to create music in active music therapy sessions. In these sessions of music creation, the use of music acts as “a means of interaction and self-

expression within a therapeutic relationship” (Darnley-Smith & Patey, 2003, p. 8). The majority of music therapists acknowledge utilizing active forms of music therapy in their practices, although a variety of methods are used to accomplish this (Darnley-Smith & Patey, 2003; Peters, 2000). Many factors can affect how music therapy is carried out in sessions, including the number of clients, the setting of the session, the aims of the session, and the theoretical orientation of the therapist (Bruscia, 1998). Music therapists will often choose the most suitable method based on the clients’ current circumstances and needs. For example, if the client is unable to actively participate in music therapy, passive modes may need to be used.

One common mode of active music intervention is the *community music therapy* model (Darnley-Smith & Patey, 2003; Peters, 2000), which provides treatment within a community in which clients live. Darnley-Smith and Patey (2003) describe the community model of music therapy as “the work undertaken by music therapists outside the boundaries of one-on-one or small group therapy sessions...applied to situations where the therapist is responding flexibly to the social and cultural context of the setting” (p. 10). Community music therapy could be group music therapy done at a nursing home or other institutional settings, such as day habilitation centers for people with disabilities or inpatient mental health or substance abuse treatment centers, where the issues and needs of each distinct community are taken into consideration.

Another mode of active music therapy is *improvisational music therapy* (Darnley-Smith & Patey, 2003; Peters, 2000). In this model, the music therapist and the client improvise music together to facilitate communication and foster a helping relationship between them. The improvisation is usually done using simple instruments such as hand drums and/or singing, unless the client has other specific music skills. This practice of music therapy is the most common in Britain, and therefore much of the music therapy research done within this region has

been done on this particular mode of music therapy (Darnley-Smith & Patey, 2003). Many sub-models of improvisational music therapy have been posited and are based on different treatment theories; however, they all contain the element of creating improvised music during sessions. *Improvised* music denotes creating original pieces of music during therapy sessions, whereas music therapists are likely to choose familiar, prewritten pieces for use in community settings or passive music therapy interventions (Bruscia, 1998; Darnley-Smith & Patey, 2003; Peters, 2000).

Passive Music Therapy

Passive modes of music therapy utilize music *listening* for its innate restorative and healing qualities (Darnley-Smith & Patey, 2003; Peters, 2000). No active creation of music is done by the client during a passive music therapy session; however, the music therapist may sing or play an instrument while the client listens. Passive methods can be used to evoke emotional responses and promote greater self-expression in the client. In passive models of music therapy, the role of the relationship between the therapist and the client is secondary to the application of music as a treatment intervention (Bruscia, 1998; Darnley-Smith & Patey, 2003). Passive music therapy also has several distinct modes of treatment that may also include guided-imagery and in-depth analysis. For optimum efficacy, music therapists will often include music that is meaningful to their clients, individualizing their selections for each client (Gerdner, 1997, 2001).

Vibroacoustic therapy is one form of passive music therapy in which the music therapist uses the vibrations of sounds, or sometimes single tones, for treating pain and/or other physical disabilities (Darnley-Smith & Patey, 2003). This particular method is also known as the “music bath”, since clients are “bathed” in sound vibrations chosen and played by the therapist (Darnley-Smith & Patey, 2003, p. 8). Vibroacoustic therapy is sometimes utilized first in order to encourage clients to later become involved in more active methods of music therapy. Some

conditions that have responded to this treatment are cerebral palsy, asthma, abdominal pain, insomnia, and sports injuries (Darnley-Smith & Patey, 2003).

Another passive method where music is listened and attended to is the *Guided Imagery and Music* (GIM) model. This method involves “listening to carefully selected... music in a relaxed state [to evoke] powerful feelings and symbolic images...leading to significant insights into therapeutic issues” (Darnley-Smith & Patey, 2003, p. 11). In this model, the music therapist chooses pieces of music based on the client’s history and current mood. There are four phases of treatment in GIM: 1) *preliminary conversation*, which serves as a guideline to the selection of music; 2) the *induction*, which invokes relaxation and focus within the client; 3) the *music listening phase*, where the client actually listens to the selected music; and 4) the *post-session integration*, where the client is encouraged to share perceptions of the experience and draw insights from it (Darnley-Smith & Patey, 2003).

Lastly, in passive forms of music therapy is the *use of recorded music as a supplement in curing illness* model (Darnley-Smith & Patey, 2003; Peters, 2000). This is the use of prerecorded music for the relief or reduction of pain, anxiety, or stress, where the music listening experience is not the primary treatment. This method involves listening to prerecorded music in order to supplement a primary treatment for a specific illness. The use of this method, along with primary treatment, can often result in pain-management clients needing fewer drugs for treating their pain (Kneafsy, 1997; Peters, 2000). Like most applications of passive music therapy, the music that is listened to for treatment in this model is music that is familiar to, and preferred by the client.

Individualized Music

Music therapy models and other interventions that incorporate familiar music will normally utilize the type and specific works of music that are preferred by the client for

individualized treatment whenever possible (Gerdner, 1997, 2001). While it may not be possible to individualize treatment for each person in a group setting, incorporating mixed modes and forms of music therapy in individual treatment regimens can get closer to this goal. For instance, in group settings, music therapists may assess preferences and include a variety of songs familiar to and preferred by several of the clients in the group. Clients may also each have individualized listening regimens when they are not in group settings; however, it is important to note that music preferences may change based on clients' current circumstances.

While different types of music may be preferred by individual clients, prior research has demonstrated that strength of music preference is based on the fulfillment of current needs of listeners (Schäfer & Sedlmeier, 2009). For example, if a listener is in need of relaxation, a preference for slow, soothing, and consonant (i.e., pleasing harmonies, not dissonant) music is likely over a preference for music featuring hard, fast rhythms and dissonant harmonies (e.g., heavy metal). Schäfer and Sedlmeier (2009) demonstrated that music's function of expressing self-identity and representing values of listeners was associated with strength of preference for different types of music, but that internal emotional states also influence music preference and allowed for variations. For instance, listening to loud rock music, while not inherently relaxing, may provide a cathartic experience for the release of stress in listeners that prefer this type of music, while others may prefer soft, slow music to help them relax during stressful situations. While many people report using soft, slow music in order to help them relax, research suggests that one of the primary functions of all types of music in any situation is the regulation of emotions, mood, and arousal (Hargreaves & North, 1999; Schäfer & Sedlmeier, 2009). The ability of music to influence these internal states serves as the foundation for music's use in therapeutic situations, and specifically, for regulating emotions and behaviors in people with AD.

Applications of Music Therapy

Autism Spectrum Disorders. Research literature regarding autism spectrum disorders (ASD) reports that most individuals with this type of disorder respond positively to music, often showing heightened interest and responses (Wigram & Gold, 2006; Whipple, 2004). Music therapists treating people with ASD utilize music as an educational tool in order to promote learning and skill acquisition (Whipple, 2004). Research supports connections between speech and singing, rhythm and motor behavior, memory for song and memory for academic material, and overall ability of preferred music to enhance mood, attention, and behavior to optimize students' abilities to learn and interact (Wigram & Gold, 2006; Whipple, 2004). Studies have shown that the use of music therapy has been beneficial to individuals with ASD predominantly in terms of improved social and behavioral skills and interpersonal relationships (Whipple, 2004). Additionally, music therapy research has revealed improved communication and language skills in people with ASD as a result of music therapy treatment (Wigram & Gold, 2006; Whipple, 2004).

Pain Management. Music therapy for pain management uses music as a means of altering the perception of pain (Kneafsy, 1997; Schorr, 1993). This can be used for people suffering from chronic pain due to ailments such as arthritis and cancer, or to help manage pain due to injury. Results from a study by Schorr (1993) on the perception of pain in women with arthritis showed that pain thresholds increased when participants listened to preferred music. Other studies on the perception of pain which utilized music therapy as an intervention have found similar results in post-operative participants and participants with cancer (Kneafsy, 1997). Findings from these studies suggest that music can reduce the perception of pain in a variety of

situations, leading to less adverse reactions to pain and lower use of medications to treat the pain in individuals receiving music therapy as a part of their treatment regimen.

Neurorehabilitation. Neurorehabilitation is an interdisciplinary treatment for people with acquired brain abnormalities, and currently, music therapy has often become a part of it (Baker & Tamplin, 2006). Music therapy is recognized as being able to facilitate the redevelopment of functional skills in people with brain abnormalities. However, the emotions of clients receiving treatment are also taken into consideration, and clients with emotional problems seem to be helped the most by music therapy in neurorehabilitation (Baker & Tamplin, 2006). Brain damage in patients receiving neurorehabilitation can be acquired through stroke, traumatic injury, or other causes, and while prognoses are usually uncertain, music therapy can help facilitate the recovery process.

One of the benefits of music therapy in neurorehabilitation is enhanced coping during the recovery period (Lee & Baker, 1997). This can be achieved through improving the self-expression of patients by either performing music or through songwriting. Improved moods and enhanced hope has also been found in cancer patients recovering from chemotherapy who were recipients of GIM therapy (Bonde, 2007). Singing songs was also found to help patients with impairments in speech, improving its rate, articulation, and intonation (Baker & Tamplin, 2006). The use of music in physical rehabilitation can additionally serve as a guide that is effective for facilitating gait training, providing a rhythm for the patients to follow (Baker & Tamplin, 2006). In addition, song lyrics used in neurorehabilitation may sometimes include instructions for daily activities which assist in their completion by improving memory for the steps involved (Sacks, 2008).

Music Interventions for Alzheimer's Disease

Music therapy and other music interventions may be as easy as playing recorded music to agitated AD sufferers (i.e., a passive music intervention) (e.g., Sung & Chang, 2005; Witzke, et al., 2008). This would usually involve playing familiar songs that the person with AD is known to enjoy in order to have the intended effect of improving mood and reducing agitation.

Although prior studies have demonstrated that passive music interventions can be effective for reducing agitation in AD, active interventions involving singing and/or playing simple instruments in a group and/or individual setting with a music therapist or musician have also been shown to be effective (e.g., Gardiner & Furois, 2000; Ledger & Baker, 2007). Playing prerecorded music for people suffering with AD is an inexpensive and noninvasive intervention that can be easily incorporated by caregivers into daily routines in order to reduce the feelings of agitation and possible disruptive and aggressive behaviors. However, some consider active participation in music therapy (e.g., singing or playing an instrument) to be the superior form of treatment for agitated AD sufferers (Gardiner & Furois, 2000; Gotell et al., 2009; Ledger & Baker, 2007).

While active music therapy interventions may be harder to implement for AD sufferers, it is posited that active interventions provide greater cognitive stimulation than the mere passive listening of music can provide (Gardiner & Furois, 2000; Ledger & Baker, 2007; Sacks, 2008). While some training may be necessary, anyone with some music ability, including informal AD caregivers, should be able to learn to implement an active music intervention with people who have an AD diagnosis. This could be as simple as caregivers singing familiar and preferred songs and encouraging their care recipients to sing along with them.

In addition to affecting agitation in people with AD, music therapy and other music interventions have demonstrated noteworthy memory retention, sustained attention, increased arousal, and positive emotional effects in people with various forms of dementia in many prior studies (Carruth, 1997; Foster & Valentine, 1998; Lee & Baker, 1997; Spiro, 2010). The recognition of these effects of music interventions helps to elucidate possible approaches for the use of music with people with AD and related dementias. Furthermore, music's encouraging effects on stimulating autobiographical memory, improving cognitive functioning, and positively affecting behavior (e.g., reducing agitation and disruptive behaviors), suggest its utility beyond that of a leisure activity and advocate for its inclusion in AD treatment regimens.

Cognitive Stimulation. Although many treatment options are available for AD sufferers, a multi-disciplinary approach including cognitive stimulation- such that music therapy provides- is considered best to maximize treatment regimen efficacy (Chapman, Weiner, Rackley, Hynan, & Zientz, 2004; Kasl-Godeley, & Gatz, 2000; Richter & Richter, 2004; Sacks, 2008). In one study of people with AD (Chapman et al., 2004), the effects of drug treatment alone with drug treatment plus a cognitive stimulation intervention were compared. Results found that the drug-treatment-alone participants showed a significant decline from baseline measures of cognitive functioning one year later, while the drug treatment plus cognitive stimulation participants nearly maintained the same level of performance after one year. Since the disease would normally progress during this time, maintaining cognitive performance through the use of cognitive stimulation demonstrates the intervention's efficacy of slowing the decline in cognitive performance (Chapman et al., 2004). That is, cognitive decline over the year-long study was expected in all participants since they had AD, though the participants receiving the cognitive stimulation intervention demonstrated significantly slower decline than the control group after a

year. Participants in the control group were offered the cognitive stimulation intervention at the conclusion of the study since results revealed its efficacy.

The intervention used in the aforementioned study included participants creating a life story involving significant events, and engagement with hobbies and other activities throughout their lives, and discussing and presenting them to others in the group. While the cognitive stimulation intervention used in this study did not utilize music directly, other research suggests that music is an excellent source for cognitive stimulation (Carruth, 1997; Foster & Valentine, 1998; Lee & Baker, 1997; Sacks, 2008). Additionally, the life story intervention, while providing cognitive stimulation, also provided social interaction, since, like many psychosocial interventions for AD including most music therapy, it was done in a group setting, which may have influenced the results (Chapman et al., 2004). Nonetheless, this study does provide some empirical evidence for cognitive stimulation's effect on AD beyond that of observational studies relying on self-report since a battery of cognitive tests, including the Mini Mental State Exam (MMSE) and the Cognitive subscale of the Alzheimer's Disease Assessment Scale (ADAS-Cog) were used. Being the most popular treatment for AD, one would assume that drug therapies are the most efficacious for treating the disease; however, the results from the aforementioned study point out the limitations of drug therapy for AD and advocate a multidisciplinary approach to its treatment, possibly including some form of cognitive stimulation like music therapy.

Other studies have also found music to directly have cognitive-enhancing effects, including improved memory, in people with AD (e.g., Foster & Valentine, 1998; Lee & Baker, 1997). Foster and Valentine (1998) found that simply playing background music during memory tasks for people with AD consistently enhanced their retrieval of autobiographical memories. Improved recall of autobiographical memories in people with AD through the use of music is

thought to be due to the associations connecting certain pieces of music to people's past experiences (Foster & Valentine, 1998; Sacks, 2008). As previously mentioned, these recalled experiences can facilitate the regulation of emotion by inducing emotions associated with the lived experiences.

In addition to autobiographical memory, Carruth (1997) reported an improvement in naming abilities in people with AD when music was used to form songs with lyrics pairing names with faces. For comparison, the researcher used the same text in a non-music situation in which the lyrics were simply spoken and not sung to a melody. A significant advantage was found for those in the music situation, with the percentage of correct face-name recognition responses being higher than the comparison group, and the majority of the music-situation participants were also able to recall names even more than one day later (Carruth, 1997). This demonstrates not only that music can have a positive effect on memory, but that music may help facilitate the formation of memories throughout life. The use of music as a autobiographical, mnemonic device for people with AD has been postulated by Sacks (2008), stating that music has the power to elicit emotions and past associations, giving people with AD greater access to forgotten memories, moods, and thoughts. This regulation of autobiographical memories and emotions is also hypothesized to be another underlying reason for music's effect of reducing agitation in people with AD (Gerdner, 1997, 2001; Koelsch, 2010; Spiro, 2010).

Research Utilizing Music Interventions for Agitation in Alzheimer's Disease

A comprehensive search of scholarly literature for music-related activities done with people with AD and other dementias revealed numerous studies conducted with varying methodologies over the past 20 years. Most of these studies have focused on reducing the agitated symptoms associated with dementia. The following review provides an overview of

what was done and the findings of the majority of the studies that examined the effects of music on agitation in people with AD and other dementias that were done over the past 20 years (1993 – 2012). The studies included were selected in order to give the reader an objective view of the findings of this area of research by including all research designs and organizing the studies by the strength of the design. It is important to note that true experimental designs were not done in this area until recently and therefore weaker methodologies, such as quasi-experimental designs, make up the predominance of studies reviewed here.

Case Studies. A broad literature search using the keywords “music” and “dementia” revealed a small number of case studies examining the effects of recorded music on older people suffering with dementia. These case studies examined the effects of participants’ preferred music on agitated and disruptive behaviors associated with dementia (Gerdner, 1997; Gerdner & Swanson, 1993; Ragneskog, Asplund, Kihlgren & Norberg, 2001). Gerdner and Swanson’s (1993) early study used a multiple case study design that included five participants who were played their preferred music each day for five days. A standardized scale, the Cohen-Mansfield Agitation Inventory ([CMAI], Cohen-Mansfield, 1997), was used to measure agitation; however, flexible, observational techniques were also done in order to capture emotions and behaviors that the scale may have missed. In this multiple case study, decreases in agitation were found both during and one hour after the music intervention for four of the five participants in this study, though no inferential statistics were used in the analysis (Gerdner & Swanson, 1993).

Another case study by Gerdner (1997) also examined the effects of preferred music in a single-subject design using flexible, observational methods. Music was played twice per week for eight weeks (e.g., with a total of 15 sessions) in order to study its effects on the participant with AD’s agitated behaviors. Observational methods were utilized to record the participant’s

behavior in a purely qualitative fashion, with the author simply noting any changes or distinctions during the sessions. Gerdner's (1997) intention was to try to understand and explain the underlying mechanisms for why music may have an effect on agitation in AD, and she proposed a theory based on the *Progressively Lowered Stress Threshold* (PLST) theory of AD (Hall & Buckwalter, 1987). The PLST theory (Hall & Buckwalter, 1987) suggests that people with AD are more prone to the effects of stress because the cognitive impairment found in dementia is hypothesized to lower one's threshold for comprehending multiple, simultaneous environmental stimuli, creating greater stress levels and making one more prone to agitation. In her model based on the PLST, Gerdner (1997) proposes that familiar music acts as a central focal point for people with dementia to attend to in their environment, and consequently reduces the stress of trying to comprehend other concurrent multiple sources of stimuli. Consequently, the lowered stress leads to less agitation and fewer disruptive behaviors.

Gerdner's (1997) single-subject case study found a decrease in agitated behavior, especially with the participant's wandering tendencies (i.e., wanting to leave). The author stated that the participant indicated no desire to quit or leave the music sessions, and that the participant actually stated that the music sessions were enjoyable. Behavioral observations recorded included the participant smiling and even dancing during the sessions (Gerdner, 1997).

A multiple case study of music's effects on agitation was done in one study of four participants with dementia (Ragneskog et al., 2001). This study used an interrupted-time series design where the music intervention was given during one period and was compared with another period without music. Each participant served as his/her own control, making this a multiple case study. Video recording was done to record observations for later coding. Observations were made before, during, and after the music and non-music sessions for

comparison purposes. Ragneskog and colleagues' (2001) multiple case study also found reductions in agitated behaviors, including screaming, in two of the four cases.

Another case study by Gardiner and Furois (2000) compared the effects of music therapy to reading in two participants, one with AD, and one with a cerebrovascular accident (CVA). The music therapy included both active singing and playing instruments, and passive listening to both live and recorded music. The reading intervention included discussion of the books.

Interventions were alternated between the two participants along with periods without treatment using an ACABA design for the CVA participant, and an ABACA design for the participant with AD. Measurement was done using a disruptive behavior rating scale through observation over nine weeks, with five observations done per week. Times of the observation were varied throughout the mornings and afternoons in order to get representative means of behaviors.

Gardiner and Furois (2000) found that the reading intervention significantly reduced disruptive behaviors, including agitated behaviors, for the participant with CVA, although during the music intervention, the participant had the highest level of disruptive behaviors measured throughout the study. Disruptive behaviors were again reduced after repeating the reading intervention with the participant with CVA, although not significantly. The participant with AD, however, demonstrated significantly lower disruptive behaviors both during and after the music therapy. The reading intervention again lowered the participant's disruptive behaviors, demonstrating the efficacy of both the music and reading interventions for the participant with AD (Gardiner & Furois, 2000). This study is important since it points out that music therapy may not be effective, and may even have negative consequences in some instances, such as with the participant with CVA. However, in this and the aforementioned case studies, the sample sizes were too small to generalize these findings.

Observational Content Analysis. An observational study by Gotell, Brown, and Ekman (2009) utilized content analysis in order to examine the effects of both background music and caregivers' singing during the regular morning care sessions of nine people with dementia. While explicit research questions were not stated in the article, the authors' aim was to examine the effects of the music and caregivers' singing on dementia patients' emotions and behavior. Drawing from prior research, the authors expected positive effects of both background music and singing. This was done using previously videotaped sessions of caregivers in their morning routines with the patients, making it a purposive convenience sample. The flexible, qualitative analysis used labeled emotions and moods without a priori codes so that new categories could emerge at any given time during the analysis without being bound to the physical distinctions of a predefined list. This means that the labels could be a single word or a phrase which the authors felt represented a specific emotion. The authors state that a qualitative analysis of this type has never been done on music's effects with caregivers and people with dementia, with similar previous studies utilizing a priori checklists of emotions and behaviors (Gotell, Brown, & Ekman, 2009).

Results from the content analysis indicated that positive effects of both music and caregiver singing were found with regards to the behavior and emotions of people with dementia (Gotell, et al., 2009). The authors also stated that caregiver moods were also enhanced due to their caregiving duties being easier since their patients were better-behaved and in improved moods. The music helped patients better express themselves, improving the communication between the caregiver and the recipient. Results also demonstrated a reduction in aggressive behaviors of the patients with dementia when in the music or singing situations, which is consistent with other music therapy literature involving people with dementia. This study,

however, did not have the people with AD actively participate in music making since the caregivers were doing the singing. This suggests the effectiveness of passive music interventions for people with dementia, although a stronger research design would strengthen this evidence.

Quasi-Experimental Designs. A pre-post-test quasi-experimental study by Brotons and Pickett-Cooper (1996) examined live music's effect on agitation in 20 people with AD from four different nursing homes. The music therapy was given twice a week for five total sessions by certified music therapists who provided live music and encouraged singing and playing instruments in participants who were able to do so. An observational checklist of seven agitated behaviors with five levels of severity was used as the primary measure. The ratings were done by caregivers and staff within the nursing homes before, during and 20 minutes after the music sessions. Musical background of participants was also obtained by surveying family members in order to assess its impact on the efficacy of the music therapy sessions.

Results indicated significantly less agitated behaviors both during and after the music therapy sessions than before the sessions (Brotons & Pickett-Cooper, 1996). Inter-rater reliability between different observers was reported to be $r = .99$, demonstrating meticulousness in observations in this study. Musical background of participants was not found to be significant with respect to agitation. Weaknesses of this study include the measurement instrument, for which no psychometric properties are given, the small sample size, and the short assessment period (i.e., only 5 sessions). However, this study is notable since it suggests that people with AD do not need a musical background in order to benefit from music therapy.

Another pre-post test design to assess music therapy's effect on agitation in people with AD was conducted by Brotons and Marti (2003). This study is important because participants were people diagnosed with probable AD and their spouses who were their primary caregivers

and lived at home with them. Most prior studies of this type have included only nursing home residents with AD. Although participants in this study did not live in a nursing home, they stayed in a rural house together for the 12 days of the study, and not in their home environments. A total of 14 couples were assessed using a pre-test and two post-tests, one given two days before the end of the music sessions and another two months after music therapy sessions had ended. The Cohen-Mansfield Agitation Inventory (CMAI), a widely used agitation scale with strong psychometric properties was used to assess agitation in the people with AD. Cognitive functioning of the participants with AD was also assessed directly with the Neuropsychiatry Inventory and Dementia Scale. Caregivers were assessed for burden, depression and anxiety, and were also asked to assess emotional and behavioral changes in their care recipients.

Brotons and Marti (2003) found that the participants with AD had significantly lower agitation and other behavior problems reported by caregivers on both the post-tests, including two months after treatment. Cognitive functioning in participants with AD, however, did not improve. The caregivers reported significantly lower anxiety on both post-tests, although burden and depression did not improve. Limitations in this study include the small sample size and the short treatment period. Additionally, testing effects from repeated testing and being placed in a new environment during the study may have influenced the results. The follow-up post-test showing persistent effects two months later also does not demonstrate a causal effect of the music therapy since many other influences on agitation and behavior may have occurred during that time (Brotons & Marti, 2003). However, this study remains important because it included both the people with AD and their caregivers in both the treatment and assessment.

A crossover-design was utilized in one study on music's effects on agitation and related behaviors in people with dementia, with each participant serving as their own control for

comparison purposes (Gerdner, 2001). Gerdner (2001) used repeated measures to compare the effects of individualized music in some sessions with sessions that utilized classical relaxation music in 39 participants using the Cohen-Mansfield Agitation Inventory (CMAI), a standardized measurement scale for agitation modified to assess agitation over 10 minute intervals over a half hour total. Baseline agitation levels were assessed over three weeks, followed by six weeks of individualized music, a two week “washout” period containing no music, and finally, six weeks of classical music. Music sessions were given twice a week during the treatment periods, for a total of 12 sessions each of individualized and classical music.

Results from this study revealed significant decreases in agitation and related behaviors in the participants with dementia from the individualized music sessions (Gerdner, 2001). Lower agitation was found both during the sessions using preferred music and a half hour afterward. While a half hour does not seem like much, the participants had moderate to severe levels of dementia and may not have even remembered that music was played, although the relaxing effects of the music still seemed to persist since lower agitation was still found (Gerdner, 2001). The individualized treatment also demonstrated a significantly greater effect on agitation than the classical music treatment. The lack of a true control group and therefore true experimental design, was due to the convenience sample used and the nonrandom assignment, however, this is commonplace with this type of research. Due to the vulnerability of elderly people with dementia, true experimental designs are usually not feasible or ethical since this would involve withholding treatment. Since each participant was in both the treatment period and non-treatment period in this study, everyone received music therapy at some point. The use of a crossover design such as this presents the strongest evidence yet known for music therapy’s efficacy in treating agitation in AD.

Another quasi-experimental design was used in one study where participants with AD were played relaxing music during their evening meals (Hicks-Moore, 2005). This study also involved repeated measures to compare the music's effects with that of no music present. Thirty participants were tested on agitation and associated behaviors before and after their meals each week for four weeks. Weeks two and four contained relaxing music during mealtimes, with the other two weeks not containing any music. The CMAI, a standardized observation scale was the sole measure of behaviors in this study.

The study by Hicks-Moore (2005) found significant decreases in agitated behaviors during mealtimes when relaxing music was played as compared to when no music was played. It is important to note that this study used a simple passive music intervention (i.e., listening to recorded music) that did not involve individualized or preferred music, but was still found to be effective in reducing agitation. Playing recorded music is an inexpensive and noninvasive intervention that can be easily incorporated by caregivers into the daily routines of those with AD in order to help reduce agitation, and may even be as simple as turning on a favorite radio station.

A Taiwanese study on music's effects on agitation by Sung, Chang, and Abbey (2006) was conducted using a quasi-experimental design that included 32 elderly participants with dementia. This study used participants' preferred music in sessions conducted twice a week for six weeks and measured agitation levels in the participants using a standardized observational measurement scale. Observers who did the ratings were trained and inter-rater reliability was also measured.

Sung et al. (2006) also found decreases in agitation and related behaviors in persons with dementia using music as an intervention. Specific findings indicated significant reductions in

physical, nonaggressive behaviors (e.g, repetitive motions) and overall agitation levels in the participants during the music sessions. This study is notable since it included Taiwanese participants, demonstrating that music's effects are also valid in this population and further advocating applicability across cultures.

Another quasi-experimental design was done by Clark, Lipe, and Bilbrey (1998) testing music's effects on agitation and aggressive behaviors in people with dementia. This study used a single group repeated measures crossover design where participants received a music intervention, had a "washout" period, and then received the music intervention again. The repeated measures design seems to be the most common in this type of research since it is usually not feasible to include a separate comparable control group. Including a one week washout period in this study as a safety measure may have helped to lessen any carry over effects that may have occurred in the first music intervention period, however, most music therapy research with persons with dementia reveal no long-term effects.

Clark et al. (1998) found significant reductions in agitation and aggressive behavior in the abovementioned quasi-experimental design. Fifteen participants were included in this study, and 12 demonstrated significant reductions in aggressive behaviors, including hitting behaviors. Two aspects of this study make it stand out from the others examined here. One is that this study used qualified music therapists, whereas many other studies have used volunteers or musicians to provide the intervention. Another distinction of this study is the use of a washout period to ensure no carryover effects were involved in the second music intervention period, and that the intervention was given and assessed twice to lessen the influence of confounding factors.

Another quasi-experimental research design using a small sample (n=5) used each participant as their own control to examine the effects of music on relaxation, agitation and

aggressive behaviors (Snyder & Olson, 1996). This study is distinctive because it compared the effects of music therapy to hand massage on aggressive behaviors in people with dementia. Though an a priori checklist of agitated and aggressive behaviors was used as a measurement tool in this study, no mention of its name or its psychometric properties was given. Frequencies were simply counted for each behavior during the observation periods. Relaxation was also assessed with the Luiselli checklist, although the validity of this scale is also unknown. Since both hand massage and music could be relaxing and affect aggressive behavior, a lack of difference between groups during intervention periods would not indicate a lack of efficacy of music. Results are reported individually for each of the five participants, with paired *t* tests also being done on data gathered before and after interventions. Relaxation was found to be significantly enhanced ($p = .05$) with music, however, agitated and aggressive behaviors were not significantly reduced (Snyder & Olson, 1996). Hand massage did not have a significant effect on either relaxation or agitated and aggressive behaviors.

The Snyder and Olson study (1996) did not find reductions in agitation and aggressive behavior in participants with dementia when using a music intervention; however, music was only played for 10 minutes each day for 10 days. This could simply mean that the hand massage intervention used for comparison was equally effective in reducing agitation since there was no true control group. This study did, however, find significantly improved levels of subjective relaxation with music in the participants when compared with hand massage and no music. Limitations of this study include the small sample size ($n = 5$), the short length of the sessions, and the use of a checklist for measurement with unknown psychometric properties.

Finally, a recent crossover study by Cooke, Moyle, Shum, Harrison, and Murfield (2011) investigated the effects of active participation in a music group by people with dementia ($N =$

47), and utilized a reading group as a control. The music group's activities included both singing and listening (i.e., both active and passive interventions), however, the effects of each were not differentiated. This study used randomization to place participants in either the music or the reading groups for 8 weeks, and then participants were switched to the alternate intervention group for another 8 weeks. The short-form of the Cohen Mansfield Agitation Inventory (CMAI-sf) was the instrument utilized to measure agitation at three different times: two weeks before the interventions, after the first intervention, measuring the previous two weeks of receiving the interventions, and after the second intervention, also measuring the previous two weeks. Anxiety was also assessed during these times. This study did not find a significant difference in agitation or anxiety between the participants when given the music or reading intervention; however, measures were significantly lower during both interventions (Cooke et al., 2011). The authors conclude that participation in a music group may not have any more benefit on agitation and anxiety than that of a reading group, which included discussions (Cooke et al., 2011). This could mean that participation in *any* group activity that involves socialization may be beneficial to those with AD or other dementias.

There were many strengths of this study that addressed some of the issues of past studies, including the length, use of randomization, use of standardized scales, and the crossover design. However, the assessment of agitation using the CMAI-sf was done over two-week periods as the instrument suggests. This means that the measures were done after the two-week intervention periods were completed. Past studies of music's effect on agitation in people with dementia have shown that reductions usually do not last long after the intervention (e.g., 30 minutes to an hour). Looking for reductions in agitation over a two-week period after receiving a music intervention was probably not precise enough to demonstrate reductions during and immediately after the 40

minute sessions that were done 3 times a week. That is, even if agitation was reduced during these times, the assessment over a two week period would likely not demonstrate a significant difference. Additionally, there was not a true control group since both groups received both interventions over the course of the study, and as previously mentioned, the social activity of the reading group may have been just as beneficial.

Experimental Designs. Few true experimental designs have been done utilizing music interventions for dementia. Additionally, no experimental designs have been done thus far that have compared the effects of active interventions to passive listening. However, one study utilizing a randomized experimental design examined the effects of passive music listening on 38 people with dementia who lived in an assisted-living facility (Janata, 2012). In this study, participants were randomly assigned to either have individualized music piped into their rooms several hours a day (e.g., around 3 hours/day), or not, for 12 weeks. An initial two-week baseline measurement was done before implementing the intervention, making the study last for a total of 14 weeks. The participants were assessed on a weekly basis for agitation and depression using standardized scales, including the CMAI for agitation (Janata, 2012).

Results from this study showed that both agitation and depression were consistently reduced for both the treatment and the control groups (Janata, 2012). Janata (2012) attributed this to diffusion of treatment. That is, because the music was played for several hours a day in the rooms of participants in the experimental group, participants in the control group were likely also exposed to music at some times during the course of the study. For example, the researcher states that participants would often enter into other participants' rooms if they liked the music (Janata, 2012). Therefore, there was not a true control group in this study, but rather an "indirect treatment group" (p. 14, Janata, 2012). That is, participants who were only indirectly exposed to

the music intervention demonstrated similar reductions in agitation and depression as the participants who received the individualized music interventions in their rooms. It is important to note that the music was not individualized for participants only indirectly receiving the intervention, yet it still may have been effective. Overall, the evidence from this study indicates that exposure to music, either individualized and direct, or not individualized and indirect, may help lessen agitation and depression in people with dementia (Janata, 2012).

Mixed Methods. With the immediate effects of music therapy on agitation in people with AD already demonstrated in prior studies (e.g., Gardiner & Furois, 2000; Sung & Chang, 2005; Witzke, et al., 2008), one study (Ledger & Baker, 2007) sought to examine the long-term effects of music therapy on agitation in this population. Utilizing a longitudinal quasi-experimental design along with observational note-taking by the therapists, participants were non-randomly chosen and assigned based on their place of residence (i.e., participants were from two different nursing homes where one nursing home used music therapy and the other did not) to either receive or not receive weekly group music therapy sessions for one year. Mean agitation scores obtained from the CMAI were calculated for each group at three month intervals for comparison. This longitudinal design used analysis of variance on agitation scores, which revealed significant differences in agitation within group participants over time but not between the two groups, however, there were large fluctuations in agitation across time for both groups (Ledger & Baker, 2007). The authors concluded that findings from this study may indicate that music therapy's effects are not long lasting after sessions since differences between the treatment and control groups were not found at the three-month intervals. However, consistent with prior research, observations made by the therapists in this study suggest initial reduced agitation both during and immediately after the music therapy sessions (Ledger & Baker, 2007).

Another study by Gerdner (2005) utilized mixed-methodology with a design incorporating both quantitative and qualitative methods. This was a small pilot study (n= 8) that used repeated measures in the participants with dementia to test for reductions in agitation levels. While this study used a standardized measurement tool (i.e., the CMAI) for assessing agitation in the participants, it also utilized flexible, qualitative methods such as open-ended interviews to more fully capture the effects of the music intervention. Additionally, this study is distinctive because the intervention was utilized on an as-needed basis, meaning that preferred music was played for the participants as they displayed agitated behaviors. Interviews were conducted afterward to ask about the effects of the music.

The study conducted by Gerdner (2005) demonstrated reduced agitation levels in the nursing home residents during the full eight week period of the study. However, this effect was only present during daytime hours. Nightshift observers reported reduced agitation in only two of the eight weeks during the nighttime. This may have been due to increased agitation in the participants during nighttime hours in general though. This study is notable since the efficacy of providing the intervention only as-needed demonstrates that preferred music can be played during times of elevated agitation to calm persons with dementia (Gerdner, 2005). Other studies have used music interventions only at set intervals (e.g., twice a week, always occurring at the same time). Because of the small sample size in this study, the effect of music given on an as-needed basis for agitation in AD would need to be further examined in order to generalize these findings.

Limitations of Prior Research

Theoretical Base. The studies included in this review have mostly found reduced agitation when using music for treating dementia. Few studies, however, have examined or

specifically tested underlying theories for the phenomenon (Gerdner, 1997, 2001; Spiro, 2010). For example, Gerdner's (1997) mid-range theory of music's effects on agitation in people with AD, which is based on the espoused PLST theory but is specific to music's effects, has not been tested extensively using empirical methods. To the authors' knowledge, no other theories specific to music's effects on agitation in people with dementia have been posited. Having a theoretical base in research of this type can not only help demonstrate that music interventions are effective for treating agitation in people with AD and other related dementias, but also how and why music may have this effect.

Experimental Designs. The lack of true experimental designs in prior studies of music therapy with people with AD is commonplace because of feasibility issues. True experimental designs are usually difficult to implement in vulnerable populations. For example, in studies examining people with degenerative diseases such as AD, true experimental designs may not be feasible or ethical since this would involve withholding treatment or manipulating daily routines, which may have negative consequences. Due to the vulnerability of elderly people with dementia, weaker research methods are frequently used, such as case studies relying purely on observation and not involving any inferential statistics (e.g., Gerdner & Swanson, 1993). Furthermore, even the quasi-experimental studies reviewed here did not have comparable control groups. The lack of comparable control groups in most of the studies reviewed diminishes both internal and external validity.

Without a control group, the effects seen in participants in these studies cannot necessarily be attributed to the intervention. There is no way to tell if something else happened that may have influenced agitation levels in the participants during the time of the study (i.e., history effects), and selection biases may also have occurred since there was no random

assignment in most of the designs. This would be probable in the case studies done on music's effects on AD (e.g., Gerdner, 1997) since participants were likely chosen to participate for specific reasons such as having known enjoyment of music. Other studies of music therapy with people with AD have utilized either subjects acting as their own controls in crossover designs or compared the music treatment group to groups receiving other treatments (e.g., hand massage, reading) without random assignment. Only one study included in this review attempted to include a true control group using random assignment (e.g., Janata, 2012), however, the participants in the control group in this study were also indirectly exposed to the music intervention (i.e., diffusion of treatment). Diffusion of treatment may have also contaminated the results found in other studies utilizing more than one group, since participants are likely to share their experiences with others, especially when studies were done in facilities where participants all live together (e.g., a single nursing home).

While other studies of music therapy with people with AD have used a control group for comparison purposes, the groups used may not have been truly comparable, and some were even residents of a completely separate nursing home where music therapy was not done (e.g., Ledger & Baker, 2007). The two groups probably vary in many ways, including daily routines, other activities and treatments, or even criteria for living in different nursing homes, making the groups not only dissimilar in many ways, but receiving other various treatments in different situations and environments, and likely affecting the outcomes of the studies. This lack of empirically-based rigor in research on music interventions for people with AD has destructive effects on internal validity and is a major limitation in this field of study.

Measurement Issues. Most music therapy research with persons with dementia revealed no long-term effects, with effects shown only 30 minutes to an hour afterward (e.g., Gerdner,

2001). If the effects of music therapy are limited to immediate and short-term effects, studies should restrict measurements to these times. For example, many studies have utilized the CMAI since it has demonstrated strong psychometric properties; however, it was originally intended to measure agitation over a two-week period (Cooke et al., 2011; Ledger & Baker, 2007). While both Cooke and colleagues (2011) and Ledger and Baker (2007) utilized the CMAI for its original assessment period of two weeks and showed no effects of music on agitation, other studies have modified the scale to measure agitation for as short a period as a half hour and have shown effects (e.g., Gerdner, 1997, 2001). This modification of the scale may influence its validity, and therefore affect the validity of these studies.

Some studies of music therapy with people with AD have used other scales with unknown psychometric properties or have relied on observation alone for assessing agitation in AD and related dementias (e.g., Gerdner & Swanson, 1993; Snyder & Olson, 1996). Additionally, the short assessment and treatment periods in many of the prior studies (e.g., only 5 sessions of music therapy) could be too short or not enough measurements done to best capture music's effects on agitation. For example, even though long-term effects of music therapy were generally not found, participants first starting this treatment may not get the most out of it during the sessions until they are acclimated to the new situation and environment. Participants may also want to "do well" in the study and appear that they are being helped by the intervention, and thus portray themselves as better off than they really are. For example, elderly participants in music therapy may want to seem like they are being helped by the intervention in order to please the therapist, and thus attempt to hide their agitation. However, this same effect could threaten internal validity in any research design relying on self-report or overt observation. All of the aforementioned measurement issues may affect the validity of this field of research, since, if the

measurements are not accurate, it would be impossible to attribute the effects of changes in agitation to music.

Intervention Issues. No prior research has compared the efficacy of a music intervention given consistently at set intervals with one given on an as-needed basis to this author's knowledge. If music therapy only works during the sessions and for a short while afterward, using it as-needed at peak agitation times could be the most effective method of delivery. Only the aforementioned small pilot study provided evidence of the efficacy of an as-needed music intervention to reduce agitation (e.g., Gerdner, 2005), therefore further research in this area is warranted.

Previous studies of music therapy with people with AD have also utilized either music used passively where participants simply listened to music (Sung & Chang, 2005; Witzke, et al., 2008) or active sessions where participants engaged in the music-making process through singing (Ledger & Baker, 2007), but none have compared passive to active music interventions. While both forms have demonstrated efficacy either separately or combined (e.g., Cooke, 2012), comparison of the two would provide further knowledge of what form to implement and in what situations. Furthermore, including both types of interventions, without distinguishing between the two, in not only research studies, but also in scholarly literature reviews and meta-analyses could affect the validity of the results.

Additionally, most research on music's effects on AD has not employed professionally trained music therapists, but often utilized the researchers themselves for providing passive interventions, or volunteer musicians for providing active interventions, such as sing-along groups. This lack of intervention fidelity can seriously affect the validity of research findings. Consistency in the method and delivery of music interventions utilized for AD and related

dementias across studies would help solidify the efficacy of these interventions and strengthen the internal validity of these studies.

Sampling Issues. Most of the studies reviewed here have used convenience sampling methods in addition to small sample sizes, therefore weakening the external validity of the findings. Results from these studies may not generalize beyond the sample and setting utilized in each study since random selection was not used. And, although random selection may be ideal, it is not feasible for the AD population and therefore studies of this kind usually rely on convenience samples. Since studies of music therapy in people with AD commonly use convenience samples (e.g., residents of a single nursing home), results cannot be expected to generalize beyond the population in the setting for each study, even when utilizing random assignment to different groups as in the classic experimental design. Nonetheless, the classic design allows *some* generalizability to other *similar* populations in *similar* settings, whereas other designs do not allow this to nearly as high a degree.

The similarity between samples and settings is key to the generalizability in any type of research. For example, the sample of people with AD in one nursing home may not be representative of the broader population of people with AD. The setting of one particular nursing home may also not be representative of other nursing homes in different areas in which daily routines and other treatments are probably varied. This and the previously mentioned factors can strongly affect the external validity of studies of music therapy in people with AD. Therefore, it would be wise to assess as many attributes of as many nursing homes and their residents with AD as possible prior to conducting any study to determine whether or not the sample and setting are truly representative of the broader population of nursing home residents with AD. However, the feasibility of such an undertaking prevents most researchers from examining this. Even if

they did, results still may not generalize beyond AD residents of nursing homes because many people with AD live at home and are cared for by family members. Indeed only one small pilot study (i.e., Brotons & Marti, 2003) investigated the effects of music intervention on AD suffers normally cared for at home.

Some studies of music therapy in people with AD included participants with other forms of dementia besides AD, and those participants may respond differently to music. This limits the generalizability of this research by ignoring the differences in AD and other types of dementia. Researchers may have to make exceptions to sampling and assignment to treatment because of both practical and ethical reasons. For example, it may not be ethical to withhold treatment in a control group, or be realistic to randomly sample an entire population. No studies of music's effects on agitation in people with AD and related dementias have been conducted using a true experimental design and incorporating a matched control group and random assignment to treatment while also using a large random sample. This is likely due to feasibility issues of such a study.

Finally, attrition may have also affected the internal and external validity of some of the studies reviewed in this paper. Since participants were elderly and had AD or related dementias which are progressive, degenerative diseases, the loss of participants over the course of the study could have been an uncontrollable factor that may have posed a threat to the internal and external validity of each study. Some studies did mention attrition rates (e.g., 4 participants did not finish the study), though none discuss how this may have influenced the results found. Future research is warranted in order to address these and the aforementioned limitations.

Summary

This chapter reviewed conceptual models of music therapy and musical activities, and their utility in treating several symptoms of a variety of disorders, with a focus on treating agitation related to Alzheimer's disease (AD) and other dementias. Both active and passive forms of music therapy and their modes were discussed along with the distinctions of each mode. Music's beneficial effects on cognition and behavior were also examined in people with dementia. The efficacy of music therapy to reduce agitation and disruptive behaviors associated with AD and other dementias was given extra emphasis since this is the author's primary area of interest for future study. A thorough review of the literature regarding the treatment of agitation with music in people with AD, and the limitations of this research, including internal and external validity issues, completed the chapter.

CHAPTER 5: METHODOLOGY

Previous studies on music's effects on agitation in elderly people with AD and related dementias have utilized either prerecorded familiar music or have used sing-along sessions with a music therapist or musicians, but no previous studies have attempted to evaluate both active and passive music interventions. The current research study focused on comparing the effects of both active and passive music interventions in order to determine which has greater effects on agitation levels in people with AD. Additionally, participants' engagement in both types of music therapy was examined in order to determine if efficacy is influenced by participation and differences when the intervention employs live music played by a musician (i.e., an active intervention) or prerecorded music (i.e., a passive intervention). Both verbal (e.g., singing) and kinesthetic (e.g., clapping) participation were examined to further distinguish the effects of participants' engagement with the interventions. Discovering exactly what type of music intervention and how to maximally engage participants in music interventions can demonstrate which is the most effective for reducing agitation in people with AD and will allow caregivers and others who treat the symptoms of the disease to utilize best practices.

This study utilized a unique sample consisting of people with moderate to severe dementia who live at home and are cared for by an informal caregiver—a population that has largely not been studied for music's effects on agitation previously—in order to help further the generalizability of the utility of music interventions to this new population. The participants were obtained from the clients of a local daytime respite center where clients already received both active and passive music interventions on a daily basis. This chapter will cover the characteristics of the respite center and its clients, the measurements that were utilized in this

study, the basic research design and procedures, the plan for data analysis, and any potential internal and external validity issues with this study and how they were controlled.

Characteristics of the Respite Center

Participants in this study included a convenience sample of clients at a daytime respite center for people who have been diagnosed with AD or related dementias. The respite center is run by an independent, non-profit organization providing numerous dementia-related supportive services to a ten-parish area centered around Baton Rouge, Louisiana. The respite program is designed to enable caregivers time to run errands, go to the doctor, or take care of other needed responsibilities, such as regular home care, since constant caregiving duties may normally prevent these activities. The respite service is provided to caregivers for 5 hours a day, one to three times a week for each client. The organization limits each client's attendance to one to three days a week in order to serve more of the community, since the facility is only equipped to provide care to up to 15 people per day. These conditions allow the facility to maintain a 1:3 ratio of staff to clientele, so that each client can receive more individual attention from staff. While the respite program provides temporary relief from caregivers' duties during the day, it also provides direct care to the clients with AD and other dementias, mostly in the form of psychosocial interventions.

Several cognitively-stimulating activities and social interventions are offered to the clients who attend the daytime respite program. Among these are arts and crafts, gardening, light physical exercise, storytelling, cooking classes, game playing, and music and pet therapy. Most of the structured activities, such as the music therapy sessions, are provided on a daily basis since clients typically only attend once or twice per week. However, some activities and services such as pet therapy and cooking classes are usually provided only once or a couple of times a week

based on the availability of session facilitators. When facilitators are not available, substitute activities are scheduled. For music therapy this means on some days the clients have a set time to simply relax and listen to prerecorded music instead of singing along with a live musician playing an instrument for accompaniment, since the volunteer musicians that lead the music sing-along sessions are not available every day of the week. In the case of pet therapy and other activities such as arts and crafts, when a facilitator is unavailable, a different activity may be scheduled in its place, such as the game Bingo. The schedule of activities is also shuffled around in this manner so that clients who usually attend the same day each week will be exposed to a variety of socially-interactive and cognitively-stimulating activities. This ensures that not only are the caregivers appreciative of the respite provided by the program, but that the clients are also benefitted through the stimulation and interaction they receive, and usually also enjoy themselves while they are there.

Clients are provided with cognitive stimulation and social interaction in some form the entire time they are in attendance at the day respite program. Simple observation of these activities elucidates their underlying positive meaning to the clients. Seeing the clients smile and laugh during game play or watching clients sing along and even dance to music during music therapy sessions makes one aware that not only are the clients enjoying themselves, but that they are also receiving the beneficial effects of the cognitive stimulation and social interaction, such as enhancing moods and reducing agitation, anxiety, and stress. This study intended to demonstrate through empirical means, the benefits of the use of music interventions, and of reduced agitation in particular, to the clients of the daytime respite center.

Characteristics of Clientele

The daytime respite center program is designed to accommodate individuals with moderate to beginning severe (i.e., middle stage to early-late stage) AD and other dementias. One requirement of entrance to the program is that clients are able to function physically on their own. Since physical functioning is usually not affected until the middle or late stage of AD, most clients have been diagnosed with middle-stage AD or other similar dementias. Some clients are in late-stage dementia, but have thus far retained enough of their physical functioning ability to not require additional care. Additionally, a thorough assessment is done on potential clients before granting entrance into the program. Part of this is assessing cognitive functioning using the Mini Mental State Exam (MMSE), a common screening measurement tool for cognitive impairment (Folstein, Folstein, & McHugh, 1975). This is done to ensure that clientele are receiving the most benefit from the services provided by the program, and treatment can be individualized to some extent. For example, certain days of the week may cater to lower or higher functioning groups. This ensures that clients are able to actively participate in at least some of the many activities offered and that clients are offered the most appropriate psychosocial interventions for their current level of functioning. While cutoff scores on the MMSE for suspected dementia are not definitive, Lourenco and Veras (2006) suggested varying the cutoff score based on the recipient's level of education and literacy. Lourenco and Veras (2006) propose cutoff scores for further testing for dementia in people who are illiterate and have scored 18-19 or below, and scores of 24-25 and below in people who are literate. While a score below 24-25 on the MMSE would normally indicate noticeable cognitive impairment, people who are illiterate but not necessarily cognitively impaired may easily fall below this score because they did not fully understand the questions (see Cognitive Impairment and Stage of Alzheimer's

Disease in the Measurements section of this chapter for more information on MMSE scores and symptomology).

The respite center has had more than 130 clients attend the program since its inception in 2007. Twenty-two of those were active clients who attended the program on a weekly or bi or tri-weekly basis during the course of the study. This client base served as the sample for the current study (see Participants in the Study below). While the majority of the clientele have reported their race as white ($n = 114$), there have been several clients who have reported being of minority races ($n = 15$). The majority of clients have also been female ($n = 81$), and report their relationship to their primary caregivers as being their daughter ($n = 53$) or spouse ($n = 52$). The average length of stay in the program for current clients ($n = 22$) is 14 months, an increase from the average length for the former, now discharged clients, at 9 months. This means that the current clients are staying in the program longer than previous clients. Clients may be discharged because their disease progresses to the point where the program cannot provide the support they need (e.g., loss of physical functioning), or the program can no longer benefit them due to greater cognitive impairment, or for other reasons such as uncontrollable disruptive behaviors (e.g., aggression towards others) or death.

Participants in the Study

All current clients of the respite center during the course of the study were eligible to participate; however, participation was voluntary, and clients may have withdrawn from the study at any time. The participants in this study had MMSE scores below 24, except for one who did not take it, but all have had an official medical diagnosis of dementia. Therefore, the participants all had at least some symptoms of early-stage dementia, and usually also some symptoms of middle-to-late-stage dementia (see Symptoms of Alzheimer's Disease in Chapter 2

and Cognitive Impairment in the Measurements section of this chapter for more information). The sample was not randomly selected from the population of people with AD or the respite center's clientele, since sample size was limited to what was available, and a larger sample size was of greater benefit to the study. The sample size was 22 participants ($N = 22$), the number of currently active clients at the respite center during the course of the study. No participants, or their caregivers when necessary, chose not to give their consent, and therefore all the active clients participated in the study. Only one previous study utilized a sample of people with dementia that did not live in assisted-living homes (e.g., Gerdner, 2005), but had the participants stay in a residential facility along with their caregivers during the course of the study. Therefore, the current study was the first to examine the effects of music on a sample of people with AD who live at home and are cared for by informal caregivers during the course of treatment to this researcher's knowledge.

Measurements

Demographics

Demographic variables of age and gender of clients was assessed at the beginning of the study, shortly after participants or their caregivers gave their informed consent to participate. Demographic information was collected from the clients' charts at the respite center and was checked for currency and accuracy. Age of participants was collected as real numbers, but was also parsed according to the following categories: *below 65*, *65-69*, *70-74*, *75-79*, *80-84*, *85-89*, and *90 and above* for descriptive data analysis. This allowed for describing frequencies and percentages of other characteristics (e.g., stage of AD) in each age group. Gender of participants was recorded as either *male* or *female* and was also used as a descriptive variable (e.g., frequencies and percentages). Race was recorded as *Caucasian* and *Other* since the majority of

prior clients have been Caucasian. Relationship to Caregiver was collected as a categorical variable with the attributes of *Son, Daughter, Spouse, Sibling, and Other*. Refer to Chapter 6 for results from the aforementioned descriptive statistics.

Cognitive Impairment and Stage of Alzheimer's Disease

This study examined stage of AD as a variable at three ordinal levels. Increased levels of agitation were expected in participants in the later stages of AD, and in those who show greater cognitive impairment, a recognized phenomenon as dementia progresses (Gardiner & Furois, 2000; Ledger & Baker, 2007; Richter & Richter, 2004; Sung & Chang, 2005). Consequently, it was expected that the effects of music therapy will be the most prominent in participants with greater cognitive impairment and baseline agitation levels. Stage of AD was operationalized as *early, middle* and *late*, and will be based on functionality and impairment of each participant according to their official dementia diagnosis. This was determined by consulting clients' charts at the respite center and referring to their diagnoses of AD. The point in time of the last update to each participant's stage of AD was also taken into consideration. If participants did not have an up-to-date assessment made within the past 90 days, an effort was made to obtain more recent information regarding their dementia status. Due to the respite center's criteria of physical functionality for admittance to the program, it was deemed unlikely that any clients were in late-stage dementia, however 6 (27.3%) of the 22 participants were found to have a late-stage dementia diagnosis, while none were found to be in the early-stage. This consequently altered Stage of AD into a dichotomous variable with only *middle* and *late* attributes.

Cognitive impairment, which should correlate with stage of AD and therefore also agitation, was also assessed by scores on the Mini Mental State Exam (MMSE; Folstein et al., 1975). The MMSE is one of the most commonly used measurement instruments for assessing

cognitive functioning and screening for dementia worldwide (Lourenco & Veras, 2006). One reason for this is its simplicity in execution, with no special skills required by the assessor. Because of its basic nature, however, when dementia is suspected more comprehensive cognitive testing is normally done before arriving at a diagnosis (see diagnosis of Alzheimer's disease section in Chapter 2). However, the MMSE is considered a valid and reliable indicator for screening cognitive functioning in the elderly (Lourenco & Veras, 2006). Psychometric properties of the MMSE have proven its worth as a screening tool for dementia and its ability to reflect the level of cognitive impairment whether dementia is present or not (Lourenco & Veras, 2006). MMSE scores were obtained from clients' charts at the respite center in order to determine their association with agitation and possibly participation in music sessions. This measure may provide greater precision than the Stage of AD, since there are only 3 stages of AD (and effectively only 2 stages in the current study), while the MMSE provides a 30 point scale.

Since the MMSE is scored globally, people who score below 25—an indication of cognitive impairment—may not have identical domain-specific impairments, but will be impaired in some of the following domains assessed by the test: *person, time & space orientation, attention and recall, language, and calculation* (Folstein et al., 1975). For example, someone who scores 17-25 may know who and where they are, the time, and be able to read somewhat, but may not be able to recall words or perform simple calculations at all. Psychometric evaluation of the MMSE has demonstrated that cutoff scores of 23-24 for suspecting dementia are highly sufficient in most instances (Lourenco & Veras, 2006), and the scores for the participants in this study ranged from 1 - 23.

Most participants in this study had a diagnosis of middle-stage dementia, with AD being the most common form of dementia. Cognitive deficits are the most prominent characteristics of

early-to-middle-stage AD (Alzheimer's Association, 2012). These may include difficulties with short-term memory and orientation, often with respect to time. Problem-solving skills also may begin to deteriorate. MMSE scores in people with early-stage AD would typically range from 21 to 28 (Alzheimer's Association, 2012). The cognitive deficits present may also interfere with complex functional activities that require memory, such as shopping, driving, and managing money. However, basic ADLs usually remain intact. Behavioral problems also may start to emerge during this stage. The most frequent behaviors in early-stage AD are agitation, apathy, disinhibition, and irritability. Social withdrawal, anxiety, and depression may also be present, but they are generally subtle at this stage.

Participants in this study mostly had a diagnosis of middle-stage AD ($n = 16$, 72.7%). MMSE scores generally range between 10 and 20 for people in this stage (Alzheimer's Association, 2012). As AD progresses to the middle stage, recent memory and cognition become more obviously impaired (Alzheimer's Association, 2012). Patients frequently become disoriented with respect to both time and location. This cognitive decline parallels a loss of abilities to perform complex tasks such as traveling alone or using home appliances. Although basic functions such as dressing and grooming are usually preserved at this stage, patients may require assistance or prompting. Behavioral symptoms such as agitation, apathy, and irritability often also increase as the disease progresses to the middle stage. In addition, anxiety and dysphoria often become evident. At this stage, wandering, delusions, and hallucinations may also begin to increase in frequency. The participants in this study who have MMSE scores of 1-23 varied greatly, with some at the upper end of cognitive functioning, but diagnosed as in the middle-stage of dementia (i.e., with scores above 20), and therefore did not have all the aforementioned symptoms of the middle stage present.

Agitation

Agitation in participants with AD, the primary dependent variable in this study, was measured by two distinct scales, including the Cohen-Mansfield Agitation Inventory (CMAI; Cohen-Mansfield, 1997), a commonly used measure of 29 observable agitated behaviors (Cohen-Mansfield, 1997; Ledger & Baker, 2007; Sung & Chang, 2005). This scale splits agitated behaviors by being either verbal or physical, and being either aggressive or non-aggressive (Cohen-Mansfield, 1997; Ledger & Baker, 2007). Consequently, four subscales are generated: *verbal non-aggressive*, *verbal aggressive*, *physical non-aggressive* and *physical aggressive* (examples of each type of behavior can be found in Chapter 2 under Agitation). However, the *verbal aggressive* and *verbal non-aggressive* subscales are often combined, which was done for this study in order to minimize the number of variables due to the small sample size. Therefore, only three subscales were used: *physical non-aggressive*, *physical aggressive*, and *verbal*. The CMAI measures these types of behaviors, and was found in prior research to have high reliability in several aspects, including internal consistency reliability ($r > 0.82$), inter-rater reliability ($r = 0.8$), and test-retest reliability ($r = 0.97$) (Ledger & Baker, 2007). It was also found to correlate significantly with other measures of agitation, demonstrating that it is a valid observational rating scale of agitation (Ledger & Baker, 2007; Sung & Chang, 2005). The CMAI is typically utilized to assess agitation through observation for periods of two weeks and has been normed using this method in populations of people with dementia.

The CMAI includes 29 specific behaviors with each belonging to one of its four subscales (e.g., *verbal non-aggressive*, *verbal aggressive*, *physical non-aggressive* and *physical aggressive*). Each of the specific behaviors is rated on a 7-point scale for frequency, with ratings ranging from *never* (1) to *several times an hour* (Cohen-Mansfield, 1997). The ratings for the 29

included behaviors are intended to measure the frequency of each behavior for the past two weeks. The CMAI manual states that “since it is impossible to include all possible examples...each line is intended to capture a group of closely related behaviors” (p. 2, Cohen-Mansfield, 1997). For example, *making strange noises* can include any verbalizations that cannot be understood as words; however, a loud, sustained sound may be classified as *screaming or shouting*. Detailed descriptions of each behavior are found in the CMAI instruction manual. For example, *kicking* is defined as “striking forcefully with feet at people or objects” (p. 12, Cohen-Mansfield, 1997). Instructions for the CMAI also recommend fitting any unlisted behaviors that may occur into the most similar one that is listed. The CMAI was created for use in nursing homes by staff, although it has also been utilized elsewhere by others including family caregivers and social workers (Cohen-Mansfield, 1997). A total score can be obtained simply by summing the ratings for each behavior, resulting in a range of scores from 29-203, with higher scores indicating greater levels of agitation; however it is recommended against using an overall score since the scores on the four subscales can be much more revealing.

The four subscales of the CMAI were identified through factor analysis, however the instruction manual suggests conducting a factor analysis whenever the scale is used since “factors may depend on the population studied” (p.5; Cohen-Mansfield, 1997). This is because some previous studies have identified different subscales or categorizations of behaviors through factor analysis. For example, Whall et al. (1999) identified only three subscales: *aggressive behavior*, *physically nonaggressive behavior*, and *verbally agitated behavior*. Since this study mostly included participants with middle-stage dementia where agitation is less prevalent than late-stage dementia, participants were anticipated to demonstrate more verbal (both aggressive and nonaggressive) and nonaggressive physical behaviors (e.g., wandering, repetitive motions)

than physically aggressive behaviors. The use of subscales may help identify not only that music may have an overall effect on agitation, but possibly what specific types of agitated behaviors are most affected.

Another commonly used scale to measure agitation in the elderly is the Richmond Agitation–Sedation Scale (RASS; Sessler, et al., 2002). This will be utilized in this study in addition to the CMAI in order to obtain richer data and strengthen findings by comparing the results from each scale. The RASS measures agitation on a continuum with sedation as the opposite pole, therefore, a neutral score (i.e., a score of 0) is indicative of being *alert and calm* (i.e., neither sedated nor agitated) (Sessler, et al., 2002). Scores range from -5 indicating that the patient is *unarousable*, to +4, indicating *combativeness*. There are specific guidelines to determining a person’s score, such as +1 indicating *restlessness*, or anxious, but not aggressive. A specific example for the criteria for this score on the RASS is “anxious or apprehensive, but movements not aggressive” for a score of +1, *restless* (Sessler, et al., 2002, p. 1339). A score of +2 indicates *agitation*, judged by “frequent non-purposeful movement,” while a score of +3 is indicative of being *very agitated*, judged by aggressive behavior in the person (Sessler, et al., 2002, p. 1339). Scores below 0 indicate increasing levels of sedation and decreasing levels of response to either verbal or physical stimulation (Sessler, et al., 2002). Although the RASS is based on the judgment of the person administering the test, it was found to be a clinically useful tool for assessing level of consciousness and agitated behavior (Sessler, et al., 2002). Inter-rater reliability was found to be very high ($r = .96$), along with its construct validity, which was determined through correlations with other scales of agitation and sedation (Sessler, et al., 2002). Moderately high correlations with the Sedation-Agitation Scale (SAS; $r = .78$) confirmed its concurrent, convergent validity, along with correlations with the Ramsay Sedation Scale (RSS; r

= -.78), and the Visual Analog Scale (VAS; $r = .93$) (Sessler, et al., 2002). Because of its ease of administration and valid and reliable psychometric properties, the RASS was incorporated into this study in order to assess agitation and sedation in addition to the CMAI.

The procedure for administering the RASS is simply to observe the person one time and assign a score based on the single observation (Sessler, et al., 2002). Positive scores indicate agitation, and therefore alertness, so no further procedure is necessary. The level of agitation is based on the aforementioned parameters defined for each score. A score of 0 indicates the absence of both agitation and sedation, and also only requires a single observation and no further procedure. Negative scores indicate sedation and require further procedure to identify the level of sedation. The procedure if not alert indicates to say the person's name and observe whether the person opens their eyes or responds in some other way (Sessler, et al., 2002). The level of sedation is determined by this response. For example, if the person awakens the first time their name is called with sustained eye contact, a score of -1 would be assigned. Increasingly negative scores indicate less response of the person being observed and prompted, down to a score of -5, indicating *no response from any stimulation*. The addition of a sedation measurement in this study may not only indicate the absence of agitation in participants, but also a level of stimulation from the music intervention. For example, if a participant seems sedated during the baseline measurement period, but not during the music intervention, this may indicate that the participant is cognitively stimulated by the music. This arousal may then lead to the person becoming more engaged with the intervention, and therefore participate at a greater level. As mentioned in the hypotheses section of Chapter 1, greater participation in the music intervention should theoretically lead to greater reductions in agitation and increased arousal in sedated clients.

Both the CMAI and the RASS were useful in assessing agitation and sedation in this study involving people with AD. Advantages of the RASS are that it is easy to administer and does not take much time to do so; however, the CMAI may be more accurate in capturing an overall average level of agitation since it assesses more specific behaviors over a longer period of time. The RASS is based on a single observation and a lone judgment call of current behaviors in the small amount of time it takes to administer the test (i.e., 30-90 *seconds*; Sessler, et al., 2002). The utilization of both the CMAI and the RASS in the current study was beneficial since it provides richer data to assess agitation and also provides a source for triangulation in order to strengthen findings. However, since the assessment period for the CMAI will be shortened to assess agitation for an hour rather than its intended 2 week period in this study, the assessment period will also be altered for the RASS to also assess agitation for an hour as well. While the CMAI specifies and classifies 29 distinct behaviors associated with agitation and generates four subscales (Cohen-Mansfield, 1997), the RASS produces a single score, and therefore will be compared to each subscale score separately for the CMAI. The administration protocols of both scales in this study will be altered by basing assessments of agitation on one-hour periods instead of their intended periods (i.e., 2 weeks for the CMAI and 30-90 seconds for the RASS), during both types of music interventions and during baseline measures (see Research Design and Procedure section for more information on how scales will be utilized).

Many prior studies of music therapy in people with dementia have altered the assessment time of the CMAI to the time period of the music sessions, sometimes even being as short as 30 minutes (e.g., Gerdner, 1997, 2001). This has generally been done in previous studies because music has not shown any long-term benefits to people with dementia, and a two-week assessment period would not demonstrate any immediate effects (see Measurement Issues in

Chapter 4 for more information). For example, if a music intervention is done for one hour on a daily basis, that is still only fourteen hours out of the two-week period of assessment and will likely not have an effect large enough to demonstrate reduced agitation during the 1 hour intervention periods. That is, if the effect of reduced agitation does not last far beyond the time of the one-hour intervention, it would not be necessary or valid to measure agitation over a two-week period. Assessment over a two-week period would not indicate whether levels of agitation were actually reduced during the time of the intervention since much more assessment time is dedicated to non-intervention periods. Only separate measurements done both during and not during the intervention can demonstrate immediate effects. This study utilized this method by comparing baseline measurements to measurements done during the music interventions, both for 1-hour lengths.

Participation in Music Therapy

The primary independent variable in this study was participation in music therapy. This was assessed through observation of the music sessions, recording if participants sang along, or danced or clapped to the music for each song. Singing was characterized as *verbal* participation, and was hypothesized to have the greatest influence on agitation since it theoretically would provide the highest level of cognitive stimulation for participants (see Chapter 1 for all hypotheses and Chapter 3 for discussion of music and cognitive processing for rationale). Physical movements, such as dancing, clapping, and foot tapping were classified as *kinesthetic* participation, which was hypothesized to have less of an effect on agitation than verbal participation. Since the participation variables were measuring the level of each type of participation, if clients did nothing but sat and listened but did not participate, they received zero scores on both verbal and kinesthetic participation measures. Since active and passive music

interventions were used, this was also recorded as a variable affecting agitation. While the passive music intervention type utilized only prerecorded music played to participants with the intention of passive listening only, some participants still actively participated through singing along or through movement to the music played, and therefore participation was evaluated in both passive and active sessions. Additionally, since clients at the site of the study were exposed to both types of intervention, participation was assessed by type of intervention and type of participation separately in order to compare one type to the other. Since long-term effects of the music interventions were not expected (Gerdner, 1997, 2001), no crossover effects from participants receiving both types of intervention were anticipated.

Research Design and Procedure

Institutional Review Board Review and Approval

This study applied for expedited approval from Louisiana State University's Institutional Review Board (IRB) once the design and procedure were finalized. Expedited approval, and not the full review process, was all that was required since participants were simply being observed in their natural environments without manipulation by the researcher. That is, the participants were already receiving music therapy interventions at the respite center individually on a weekly, bi-weekly, or tri-weekly basis, and the researcher and an additional observer simply sat in the music sessions with the participants and at other times for baseline measurements to observe and fill out the scales and ratings being utilized (e.g., CMAI, RASS, verbal and kinesthetic participation). There was minimal risk to participants engaged in the music sessions or baseline observations, and staff was available for assistance to clients at any time when needed, since the study was conducted on site within the respite center.

Participant Informed Consent

Participants who volunteered to be included in this study were first asked to sign an informed consent form, which explained the purpose and procedures utilized in the study. The informal caregivers were asked to sign the consent form when the participant was unable to give their own consent due to their severity of cognitive impairment. The researcher attempted to gain permission from both the primary caregivers and the clients; however, in some instances clients were not able to give their own consent such as when dementia affected reading comprehension or language ability. When clients were unable to give consent, the primary caregiver gave consent in order for the client to participate. The signed consent forms are kept on file at the respite center. Demographic variables of age, gender, and stage of disease, and MMSE scores were obtained from the participants' files at the respite center after obtaining permission from either the client or the primary caregiver for the requisite information. The participants in this study were also assigned a subject number after giving their informed consent to participate in order to protect their anonymity and confidentiality during the course of the study.

Research Design and Procedure

The study followed a one group, pre-post test design with several statistical and methodological procedures implemented to strengthen validity. The one group, pre-post test design was utilized out of necessity since the study examined a preexisting music program at a respite center where the researcher did not have control over the intervention implementation procedures or assignment of participants who were exposed to both active and passive music interventions. However, several methods were implemented to increase the validity of this design.

First, to strengthen the design, was the use of multiple baseline measurements for comparison to the intervention periods. Baseline measurements were done by observing participants during time periods at the respite center other than when clients were receiving either a passive or active music intervention, for one hour per week per one hour music session. Because the respite center has scheduled activities throughout the day, baseline measurement periods were randomized so that the possible effects of other activities on agitation may be minimized. All activities during the baseline measurements did not have music on in the background. The multiple baseline observations over the 10 week course of the study were intermittent observations done at varying times of the day to aid in the accuracy of baseline agitation measurements. Since agitation may be influenced by other activities at scheduled times during the day (e.g., lunch, arts & crafts time), baseline observation times were varied each week in order to find an average level of agitation throughout the day. This time-sampling technique was done in order to factor out varying agitation levels due to either time of day or the effect of other activities done at the respite center. For example, if baseline measures were done at the same time each week, it would likely have been during a particular activity (e.g., clients do arts and crafts at 2 p.m. on Wednesdays), which may have had a particular influence on agitation levels. This, along with agitation levels generally increasing in people with dementia as the day unfolds (i.e., a phenomena known as sundowning; Alzheimer's Association, 2012), means that in order to obtain more accurate baseline measurements, data were collected at various times throughout the day. If baseline measurements were always done at a specific time, it would likely have been during one particular activity for most participants. Since this researcher is not interested in comparing music interventions with another activity, but to an average of other time

periods, baseline measurements were done during a different time of day each day that measurements were done.

Another strength in the current study's design was the use of multiple pre and post tests over a relatively long time period, rather than a single measurement. Clients received music interventions for one hour each day, with active sessions usually on Mondays and Tuesdays, and passive sessions on Wednesdays, Thursday, and Fridays. The study assessed agitation during 10 sessions each of both active and passive interventions over a 10 week period (i.e., 20 total intervention periods), and compared that to 20 observations done without music where agitation was also assessed on the same days as the music interventions in order to establish a baseline for agitation. Since some clients attend the respite program twice or three times a week, some participants were included in both active and passive groups on different days; therefore measurements were made and compared for each day individually in order to ensure that the same participants were being compared during baseline and music intervention periods. Additionally, since active sessions were not always provided on both Mondays and Tuesdays, only one active and one passive session were observed each week. Both the music sessions and baseline measurement periods lasted for one hour each time. This resulted in 40 total hours of observation per participant over a 10 week period, which provided a more accurate assessment of agitation than a single measurement done during a single session. For example, in each week of assessment, one hour was assessed during an active music intervention, one hour during a passive music intervention, and one hour during a randomized time other than the music intervention on each day of observation in order to establish baseline agitation levels.

Music sessions, whether involving a live musician and the clients singing familiar songs (i.e., active), or simply clients listening to prerecorded music (i.e., passive), were observed each

week for coding of agitated behaviors, sedation, and participation. Passive sessions included listening to prerecorded music while either having coffee or a snack, watching a slide show with music, or simply sitting and listening to music. One, 1 hour active session and one, 1 hour passive session, along with 1 hour without music on each of the two days observing music sessions were observed each week of the study for each participant. Levels of agitation were assessed using the Cohen-Mansfield Agitation Inventory (CMAI; Cohen-Mansfield, 1997), a standardized scale for measuring agitation, and the Richmond Agitation – Sedation Scale (RASS; see Measures section in this chapter for further information on the scales that were used).

Observer Training and Reliability

Two coders were trained through the use of the scales' manuals and preliminary observations of agitated behaviors at the respite center, and were utilized for the assessment of agitation using the CMAI and the RASS on observations of both the music sessions and during other time periods in order to establish baseline measurements. The coders explained to the clients before the sessions that research was being conducted on music therapy and that they will be observed for the next hour, and also were asked to act naturally as if the observers were not there. This minimized the clients attempting to engage with the coders during observation periods. Additionally, during the music sessions coders also assessed levels of participation in the clients. Inter-rater reliability was established for both scales and level of participation measurements prior to collecting data for analysis to ensure the quality of all the ratings. Cohen's Kappa was used to measure inter-rater reliability and was set at a threshold of 0.61 or higher, a level considered substantial (Landis & Koch, 1977), before proceeding to collect the data for analysis. The two observers then each assessed half of the participants in each session to increase

the accuracy of the ratings, since accuracy would have probably suffered if both observers attempted to assess every client during every session. This resulted in each observer assessing only 2-5 clients per session.

Data Analysis

The data obtained from the scales used in this study were initially analyzed for quality using visual methods, including creating scatterplots and histograms for each variable, to ensure assumptions of linearity and normality were met. Because of the small sample size ($N = 22$), however, considerable variability in variables was found but was acceptable for a study of this size. For descriptive statistics, frequencies and percentages were obtained for non-parametric variables and central tendency measures were calculated for parametric variables. Inferential analyses were done utilizing agitation as the dependent variable and music intervention type as the independent variable. Correlations were also utilized to reveal potential associations between the type of music intervention, participation in the sessions, demographic variables, and agitation levels. Averages of variables over the 10 week course of the study were also analyzed in a similar manner to assess the reliability and consistency of findings using meta-analysis techniques, treating each day of observation as a separate study. All statistical analyses were done by means of SPSS (Statistical Package for Social Sciences) and CMA (Comprehensive Meta-Analysis) software.

Power Analysis

A priori power analysis was conducted to ensure that the anticipated sample size was sufficient to detect a small to medium effect size. It is accepted as a general rule in social science research that 10 subjects per predictor are necessary (Cohen, 1988). This study followed this guideline by including two potential predictors of agitation (e.g., type of music intervention and

participation) with a sample size of $N = 22$. A priori power analysis utilizing the coefficient of determination ($R^2 = .25$), reveals that a sample size of $N = 31$ is necessary with alpha level set at .05 and power level at .80 and would be acceptable for detecting an estimated effect size of .31, a relatively small effect (Cohen, 1988), when utilizing three predictors. However, since this sample size is smaller, ex post facto power analysis was also conducted on the data collected to ensure the sample size obtained was large enough to show statistical significance without a high probability of error. Ex post facto power analysis also ensured results could be interpreted with confidence and minimized Type II error, using a .80 power level as a standard for adequacy (Cohen, 1988), and an alpha level (i.e., Type I error) standard of .05. Because of the small sample size in this study, some later adjustments to ex post facto power analysis were necessary, but will be addressed when discussing the limitations.

Descriptive Statistics

Demographic variables of age and gender will be reported with frequencies and percentages for the aforementioned categories, with age additionally having mean and standard deviation as a continuous variable. Stage of AD will be treated as another variable, with frequencies and percentages in each stage, and age and gender reported within each stage. Mean agitation levels obtained from scores on the CMAI and RASS both before and after implementing the music interventions will also be given for each week of the study along with corresponding standard deviations. Grand means and standard deviations for all continuous variables over the 10 week course of the study will also be given.

Inferential Statistics

Data will be further analyzed utilizing inferential statistical methods, first by using simple *t*-tests to compare intervention periods to baseline measurements due to the small sample size.

Repeated measures were used to assess differences in agitation levels between baseline and intervention periods, before and after implementing the music interventions. In order to assess how the two types of music interventions differ from one another in affecting agitation levels, each day of observation, which included 1 hour of observation of either an active or a passive music intervention and 1 hour of a baseline observation, was treated as a separate study and included in a meta-analysis. This was necessary due to some overlapping participants in both the active and passive groups. That is, since some clients were at the respite center more than one day per week, they participated in both active and passive music sessions.

Agitation levels for each day of observation were expected to be reduced while receiving the music interventions and immediately after in all participants; however, the greatest reduction was predicted to be seen in those with agitation that was higher at baseline levels. Additionally, agitation was predicted to be decreased more from baseline levels for participants in active music interventions than those in passive interventions. Levels of agitation were also predicted to continue increasing as the study progressed through its 10-week course since participants' stage of AD may worsen during this time (see Internal and External Validity Issues below). It was not posited that the music intervention's effects would continue for long after each individual session was completed, and therefore decreasing overall agitation over the 10 week period of the study was not anticipated.

Since the effects of music on people with AD and related dementias who live at home during the course of the study have not been examined previously, the current research may expand the generalizability of the knowledge base of the effects of active and passive music interventions for people with dementia. This study hopes to illustrate the efficacy of music's

power to reduce agitation to a broader population of people with AD who live at home while receiving respite services that include music interventions.

CHAPTER 6: RESULTS

Results of the current study were obtained by inputting the raw data from the measures used into IBM Corp. SPSS (Statistical Package for Social Sciences) software for the initial analysis of each day of observation. This included one baseline measurement and one intervention session (either passive or active) per day. Further analysis was done utilizing Biostat, Inc. Comprehensive Meta-Analysis software in order to combine and compare the days of observation and the passive and active music interventions. Additionally, demographic information about the participants was calculated using Microsoft Excel software in order to obtain frequencies and percentages.

Demographic and Descriptive Data

The present, active clientele at the respite center during the time of the study ($N = 22$) was made up of 45.5% females ($n = 10$) and 54.5% males ($n = 12$). With respect to race, 86.4% ($n = 19$) reported their race as white, while 9.1% ($n = 2$) reported being African-American and 4.5% ($n = 1$) stated Hispanic. No other races were recorded among the current clientele. Twelve (54.5%) of the clients reported their primary caregiver as their spouse, with seven (31.8%) reporting their daughter, two (9.1%) reporting their son, and one (4.5%) reporting their sister as their primary caregiver. The age range for the participating clients was 66 to 93 years of age with a mean age of 80.7 ($SD = 7.52$). While this sample may not reflect the broader general population of those diagnosed with AD, it is important to note that the clients live at home with their families caring for them, except when at the respite center during daytime hours, either one ($n = 11$), two ($n = 8$), or three ($n = 3$) days per week.

Mini-Mental State Exam (MMSE) scores for the participants in this study ranged from 1 - 23. Participants in this study mostly had a diagnosis of middle-stage AD ($n = 16$, 72.7%).

Additionally, 6 (27.3%) of the 22 participants were found to have a late-stage dementia diagnosis, while none were found to be in the early-stage. Demographic information on the participants in the study for nominal and ordinal data is summarized in Table 1 below.

Table 1

<i>Participant Demographics</i>	<i>n</i>	<i>%</i>
Gender		
Male	12	54.5
Female	10	45.5
Age		
65-69	2	9.1
70-74	3	13.6
75-79	4	18.2
80-84	5	22.7
85-89	6	27.3
90+	2	9.1
Race		
White	19	86.4
Other	3	13.6
Stage of Dementia		
Moderate (2)	16	72.7
Severe (3)	6	27.3
Relationship to Caregiver		
Spouse	12	54.5
Daughter	7	31.8
Son	2	9.1
Sister	1	4.5
Days/Wk. at Respite Center		
1	11	50.0
2	8	36.4
3	3	13.6

The means, standard deviations, and ranges for the parametric variables of age, MMSE scores, and attendance and number of each type of session appear below in Table 2.

Table 2

Means, Standard Deviations, and Ranges of Age, MMSE, and Attendance and Number of each

<i>Type of Session</i>	<i>x</i>	<i>SD</i>	<i>Range</i>
Age	80.7	7.5	66 - 93
MMSE	13.9	6.7	1 – 23
Active Attendance (n)	7.3	1.2	5 - 9
Passive Attendance (n)	7.1	1.7	5 - 10
Baseline Attendance (n)	6.9	1.3	5 – 9
Active Sessions (n = 10)	3.1	2.5	0 – 8
Passive Sessions (n = 10)	3.4	2.4	0 – 8
Baseline Sessions (n = 20)	6.1	4.2	1 – 15

Table 3

Mean Percentages and Standard Deviations (in Parentheses) of Verbal and Kinesthetic Participation in Total Number of Songs in Active Sessions

Active Session	<u>Participation</u>	
	Verbal	Kinesthetic
Week 1	36.5 (30.2)	23.0 (22.0)
Week 2	43.8 (35.5)	40.2 (35.4)
Week 3	48.8 (45.3)	36.9 (34.0)
Week 4	63.3 (32.1)	20.0 (31.5)
Week 5	26.1 (33.5)	30.7 (37.0)
Week 6	37.5 (37.3)	23.5 (28.6)
Week 7	32.3 (31.2)	26.3 (43.6)
Week 8	19.3 (29.4)	20.0 (37.5)
Week 9	5.9 (9.1)	37.3 (40.2)
Week 10	10.6 (22.4)	31.3 (39.4)

Table 3 above displays the mean percentages and standard deviations of the verbal and kinesthetic participation in the active music sessions for each week of the study. The percentages reflect the number of songs in which participants either sang, hummed, or whistled songs (i.e., verbal participation), or moved rhythmically to the music in some way (i.e., kinesthetic participation). Both types of participation were measured per song and counted with participation of any part of each song. Percentages were used because the number of songs performed varied for each session. Additionally, there were 4 separate performers who led the active music sessions, which also varied each week, and may have influenced participation.

Figures 1 through 8 below display line graphs for the means of each agitation measure (RASS, Physical Aggression [CMAI], Physical Non-Aggressive [CMAI], and Verbal [CMAI] agitation), per week separately for the passive and active music sessions with their respective baseline measurements.

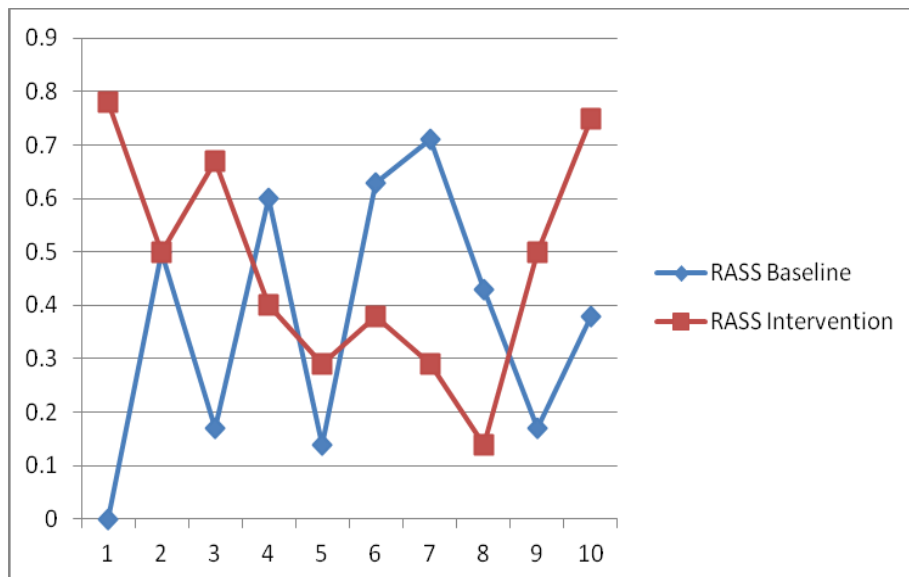


Figure 1: Mean RASS Scores for Active and Baseline Sessions per Week

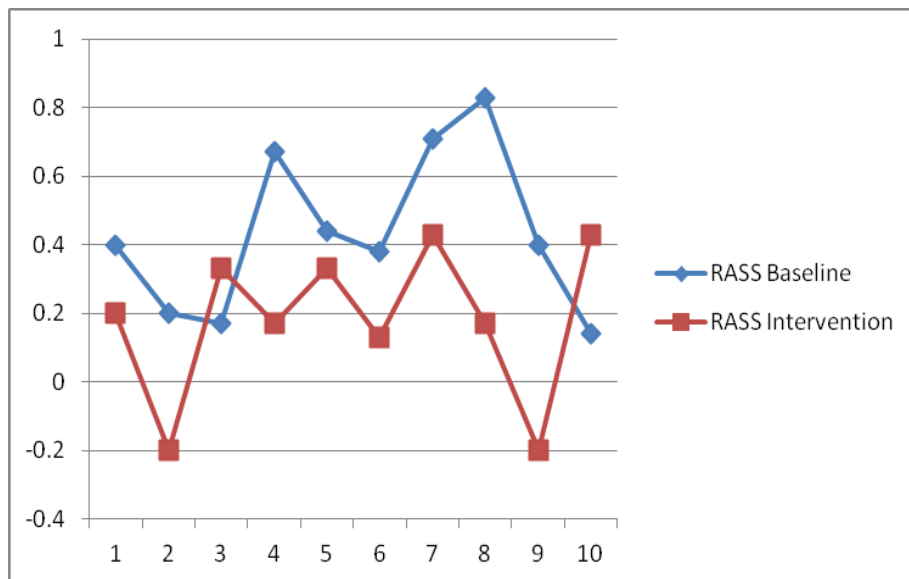


Figure 2: Mean RASS Scores for Passive and Baseline Sessions per Week

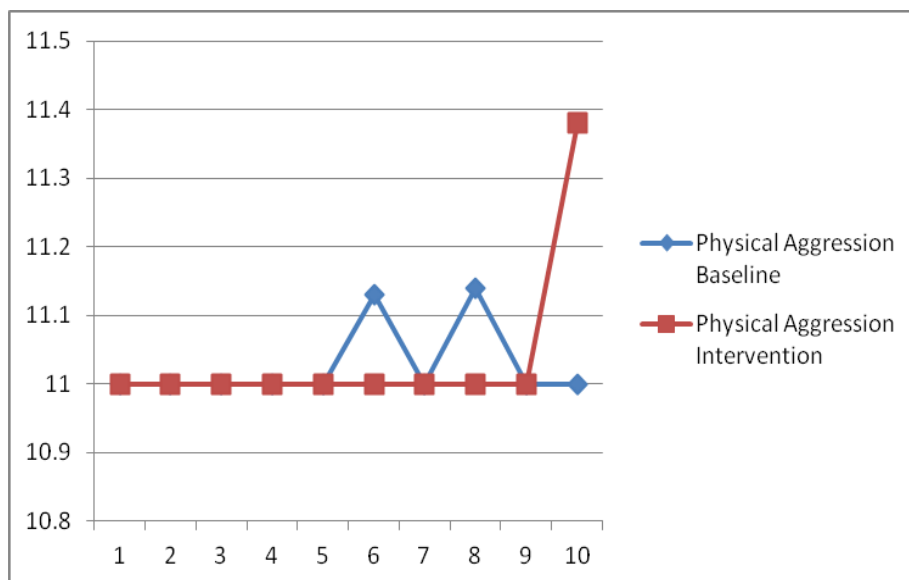


Figure 3: Mean CMAI Scores for Physical Aggression during Active and Baseline Sessions per Week

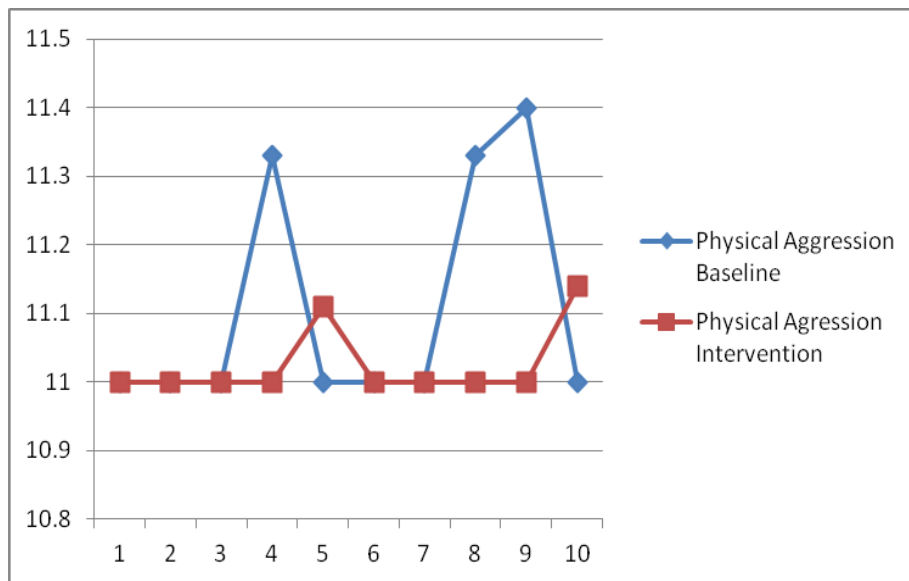


Figure 4: Mean CMAI Scores for Physical Aggression during Passive and Baseline Sessions per Week

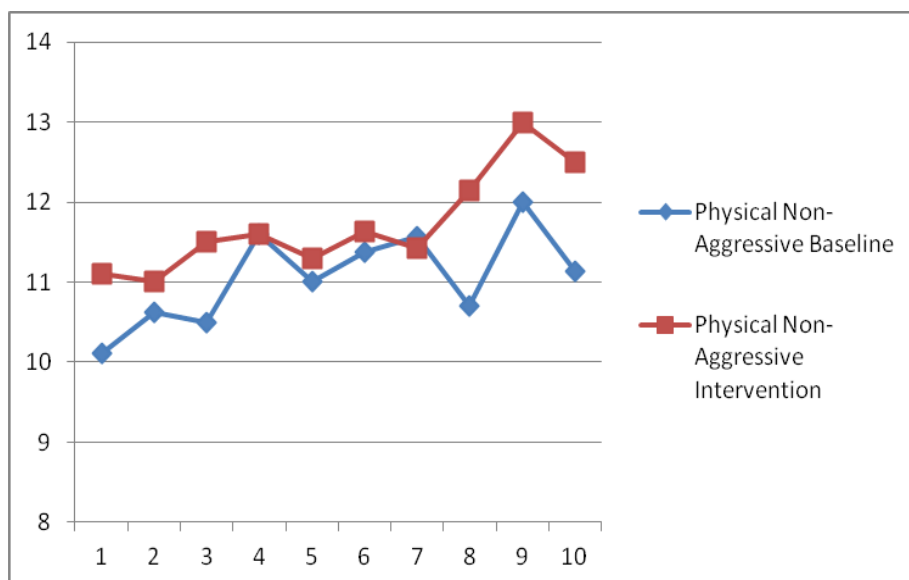


Figure 5: Mean CMAI Scores for Physical Non-Aggressive Behaviors during Active and Baseline Sessions per Week

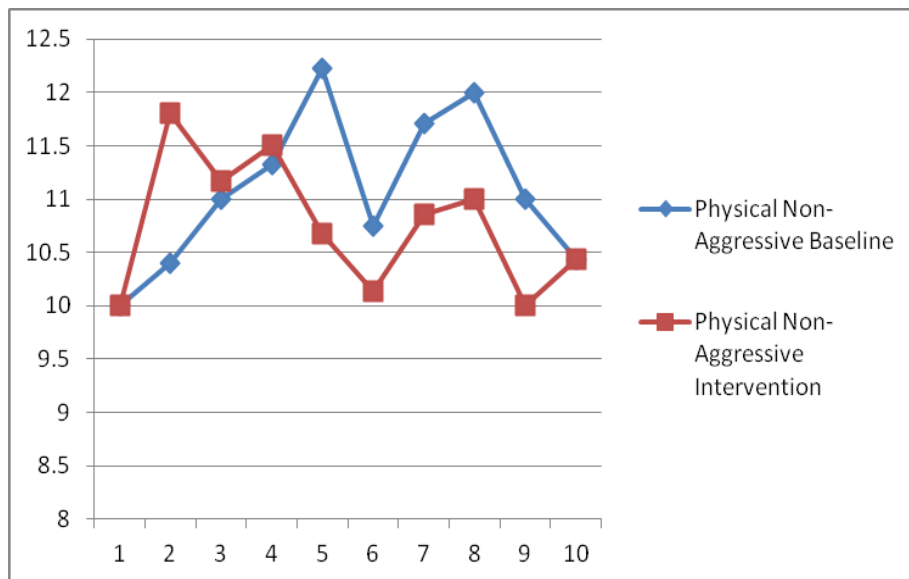


Figure 6: Mean CMAI Scores for Physical Non-Aggressive Behaviors during Passive and Baseline Sessions per Week

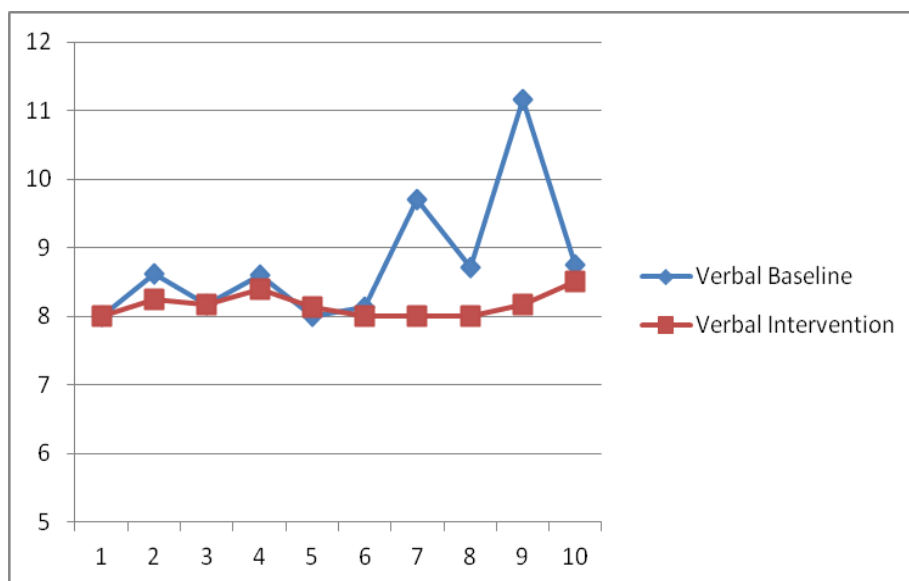


Figure 7: Mean CMAI Scores for Verbal Behaviors during Active and Baseline Sessions per Week

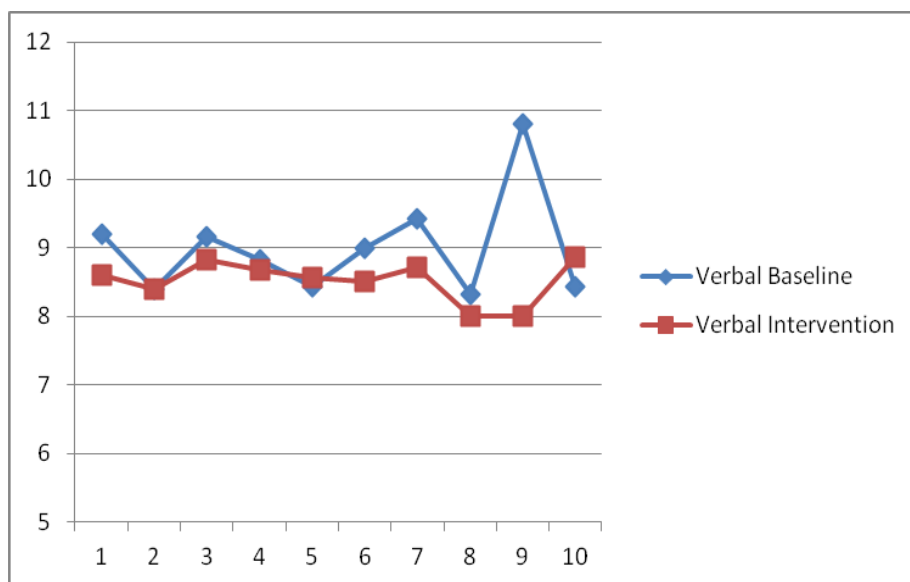


Figure 8: *Mean CMAI Scores for Verbal Behaviors during Passive and Baseline Sessions per Week*

Inferential Statistics

Overall participation was obtained by calculating a grand mean for verbal and kinesthetic participation percentages for the entire 10 weeks of the study. Grand means were also obtained for the measures of the RASS, Physical Aggression (CMAI), Physical Non-Aggressive agitated behaviors (CMAI), and Verbal agitation (CMAI); however, scores on these scales were first standardized into *z*-scores due to the non-independence of the weekly sessions. That is, most participants were involved in more than one week of the study, but the number of observations varied for each person (see Table 2 for means for attendance of each type of session). Additionally, several participants were involved in both active and passive sessions due to attendance at the respite center multiple days per week.

Table 4 on the next page presents the correlations between overall participation and the agitation measures in the active sessions for all 10 weeks of the study. Verbal participation was

found to significantly correlate to lower Physical Non-Aggressive behaviors on the CMAI ($r = -.71, p < .05$, two-tailed). Additionally, Physical Aggression and Verbal agitation were significantly correlated ($r = .67, p < .05$, two-tailed). No other significant correlations were found.

Table 4

Correlations between Overall Participation in Active Sessions and Agitation Measures

Measure	1	2	3	4	5	6
1. Verbal Participation	-					
2. Kinesthetic Participation	-.55	-				
3. RASS	-.11	.25	-			
4. Physical Aggression (CMAI)	-.42	.48	.47	-		
5. Physical Non-Aggressive (CMAI)	-.71*	.54	.01	.43	-	
6. Verbal (CMAI)	-.14	.25	.40	.67*	.28	-

* $p < .05$ (two-tailed)

Matched-pair t -tests were done for each day of observation in order to test for significant differences between the music sessions and the baseline observations each week. Table 5 on the next page displays the means and t -scores for each agitation measure for each week by the type of observation session. Only two results either significant or approaching significance were found in these initial analyses of the differences between the baseline and active and passive intervention sessions. One was a significant *increase* from baseline in the RASS during the active session in week one. Second was a decrease in Verbal agitation on the CMAI during the active session of week 7 approaching significance ($t = 2.20, p < .07$, two-tailed).

Table 5*Means and t-Scores for Agitation Measures per Session*

Week	Measure	Active			Passive		
		Baseline	Intervention	<i>t</i>	Baseline	Intervention	<i>t</i>
1	RASS	0.00	0.78	-2.80*	0.40	0.20	1.00
	PA (CMAI)	11.00	11.00	-	11.00	11.00	-
	PN (CMAI)	10.11	11.11	-1.00	10.00	10.00	-
	V (CMAI)	8.00	8.00	-	9.20	8.60	1.00
2	RASS	0.50	0.50	-	0.20	-0.20	0.59
	PA (CMAI)	11.00	11.00	-	11.00	11.00	-
	PN (CMAI)	10.63	11.00	-1.00	10.40	11.80	-2.06
	V (CMAI)	8.63	8.25	1.16	8.40	8.40	-
3	RASS	0.17	0.67	-2.24	0.17	0.33	-1.00
	PA (CMAI)	11.00	11.00	-	11.00	11.00	-
	PN (CMAI)	10.50	11.50	-1.07	11.00	11.17	-0.54
	V (CMAI)	8.17	8.17	-	9.17	8.83	0.50
4	RASS	0.60	0.40	0.54	0.67	0.17	1.17
	PA (CMAI)	11.00	11.00	-	11.33	11.00	1.58
	PN (CMAI)	11.60	11.60	-	11.33	11.50	-0.08
	V (CMAI)	8.60	8.40	0.34	8.83	8.67	1.00
5	RASS	0.14	0.29	-1.00	0.44	0.33	0.32
	PA (CMAI)	11.00	11.00	-	11.00	11.11	-1.00
	PN (CMAI)	11.00	11.29	-0.34	12.22	10.67	1.62
	V (CMAI)	8.00	8.14	-1.00	8.44	8.56	-0.26
6	RASS	0.63	0.38	0.61	0.38	0.13	0.80
	PA (CMAI)	11.13	11.00	1.00	11.00	11.00	-
	PN (CMAI)	11.38	11.63	-0.21	10.75	10.13	1.26
	V (CMAI)	8.13	8.00	1.00	9.00	8.50	0.61
7	RASS	0.71	0.29	1.44	0.71	0.43	0.80
	PA (CMAI)	11.00	11.00	-	11.00	11.00	-
	PN (CMAI)	11.57	11.43	0.16	11.71	10.86	0.71
	V (CMAI)	9.71	8.00	2.20+	9.43	8.71	1.37
8	RASS	0.43	0.14	0.55	0.83	0.17	1.58
	PA (CMAI)	11.14	11.00	1.00	11.33	11.00	1.58

	PN (CMAI)	10.71	12.14	-1.13	12.00	11.00	0.87
	V (CMAI)	8.71	8.00	1.26	8.33	8.00	1.58
9	RASS	0.17	0.50	-1.00	0.40	-0.20	1.00
	PA (CMAI)	11.00	11.00	-	11.40	11.00	1.00
	PN (CMAI)	12.00	13.00	-0.97	11.00	10.00	1.00
	V (CMAI)	11.17	8.17	1.58	10.80	8.00	1.10
10	RASS	0.38	0.75	-0.70	0.14	0.43	-1.55
	PA (CMAI)	11.00	11.38	-1.43	11.00	11.14	-1.00
	PN (CMAI)	11.13	12.50	-1.01	10.43	10.43	-
	V (CMAI)	8.75	8.50	0.37	8.43	8.86	-1.00

**p < .05 (two-tailed), +p < .07 (two-tailed), PA = Physical Aggression, PN = Physical Non-Aggressive, V = Verbal*

Meta-Analysis

Meta-analysis was conducted on the data obtained from each day of observation in order to accommodate the overlap in participants in both active and passive sessions and for each week. Additionally, meta-analysis takes the small sample size into consideration, weighting each day accordingly, which increases the power available and allows for a clearer representation of the overall effects of each agitation measure. Forrest plots for each of the agitation measures (RASS, Physical Aggression [CMAI], Physical Non-Aggressive [CMAI], and Verbal [CMAI]) appear on the pages below for passive and active sessions separately. Additional plots for each measure display meta-analyses comparing the active and passive sessions using the intervention sessions only, and also comparing the active and passive interventions using mean differences between intervention and baseline measurements.

First, results from the meta-analysis indicate an effect approaching significance favoring the passive over the active intervention for the RASS (Figure 11) ($z = -1.78, p = .076$). However, this effect is strengthened and becomes statistically significant at the standard $p < .05$ level when

also taking the baseline measurements into account using the mean differences (see Figure 12) ($z = -2.30, p = .021$). Next, Figure 17 reveals that for Physical Non-Aggressive behaviors on the CMAI, baseline sessions are favored over the active music sessions ($z = -2.06, p = .04$), but not for the passive sessions. Consequently, passive music interventions are favored over active interventions, as seen in Figure 19 ($z = -2.50, p = .01$). This effect is strengthened as well by using the mean differences in intervention and baseline measurements (see Figure 20) ($z = -3.39, p = .001$). Lastly, Verbal behaviors on the CMAI were found to be significantly reduced during the active music interventions over the baseline measurements (see Figure 21) ($z = 2.01, p = .04$), but not for the passive sessions. Accordingly, active sessions are favored over passive sessions for Verbal behaviors, approaching significance ($z = 1.80, p = .07$). This effect also became statistically significant at the $p < .05$ level, as seen in the final analysis, when the differences in baseline and intervention measurements are taken into account (see Figure 24) ($z = 2.50, p = .01$). No other statistically significant or approaching significant effects were found. Figures 9 through 24 follow on the next 16 pages.

The aforementioned results from the inferential analyses and the meta-analyses will be discussed thoroughly regarding their interpretation and possible implications in the next chapter, along with the limitations of the current study and potential recommendations for future research in the area.

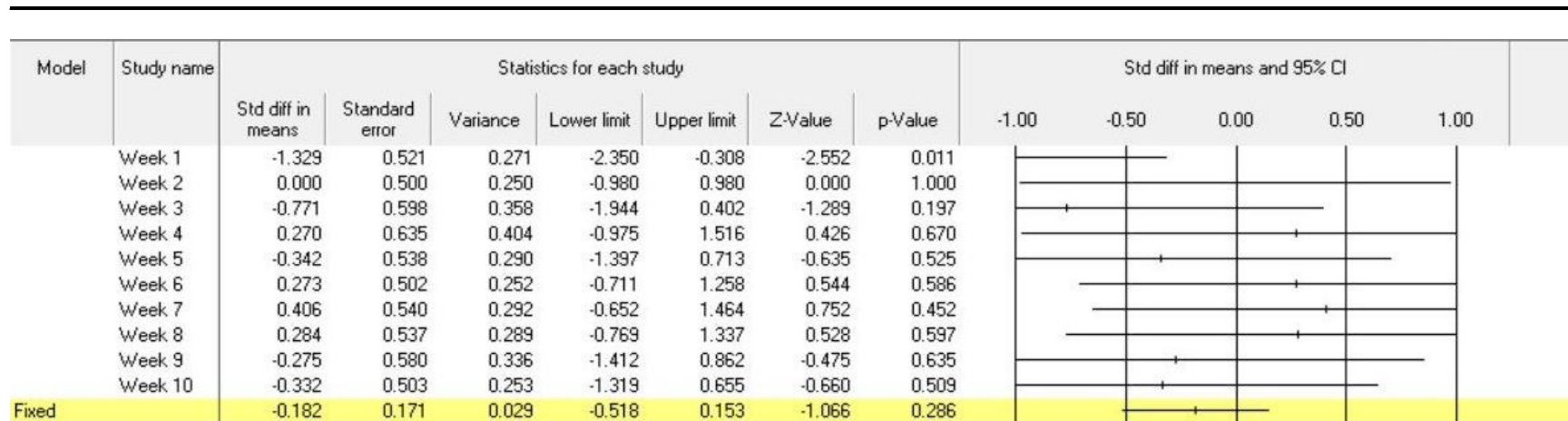


Figure 9: RASS Meta-Analysis for Active and Baseline Sessions. Negative Values favor Baseline, Positive Values favor Active Intervention

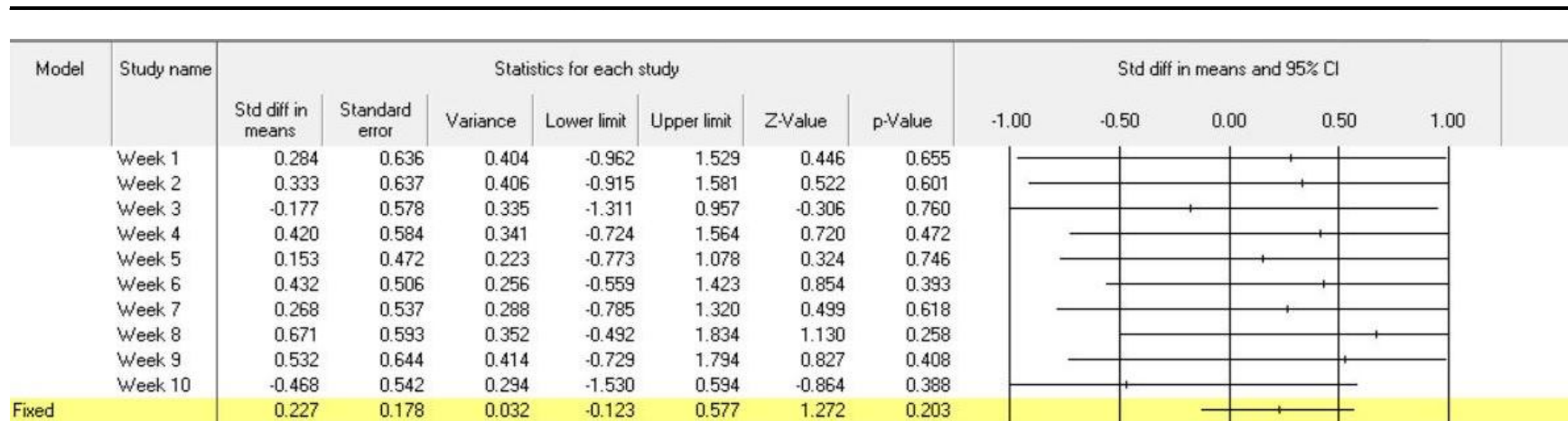


Figure 10: RASS Meta-Analysis for Passive and Baseline Sessions. Negative Values favor Baseline, Positive Values favor Passive Intervention

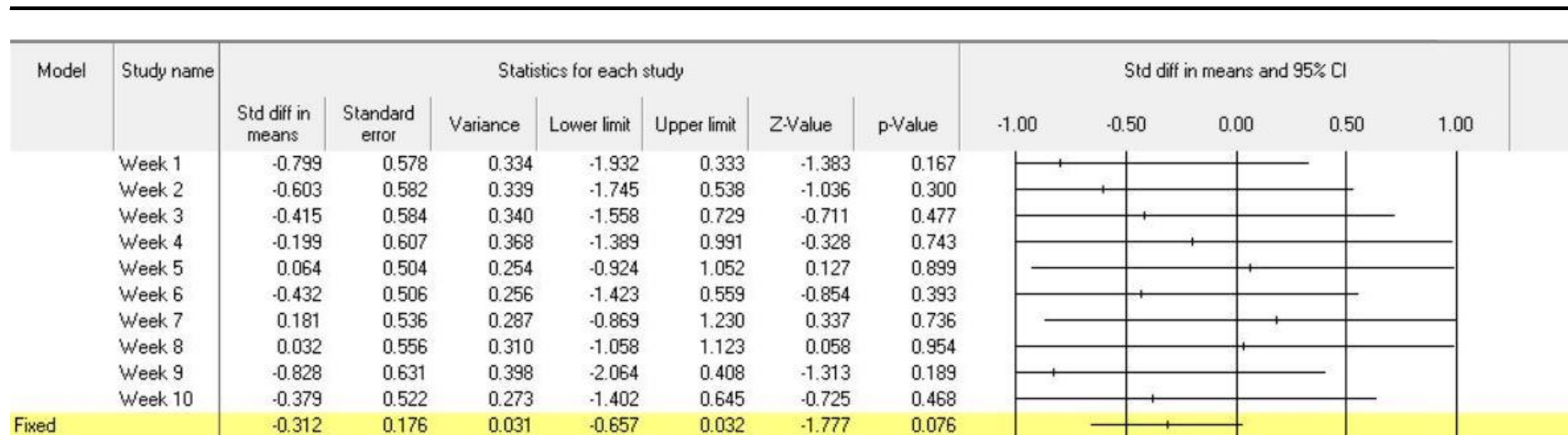


Figure 11: RASS Meta-Analysis Comparing Passive and Active Sessions. Negative Values favor Passive Intervention, Positive Values favor Active Intervention

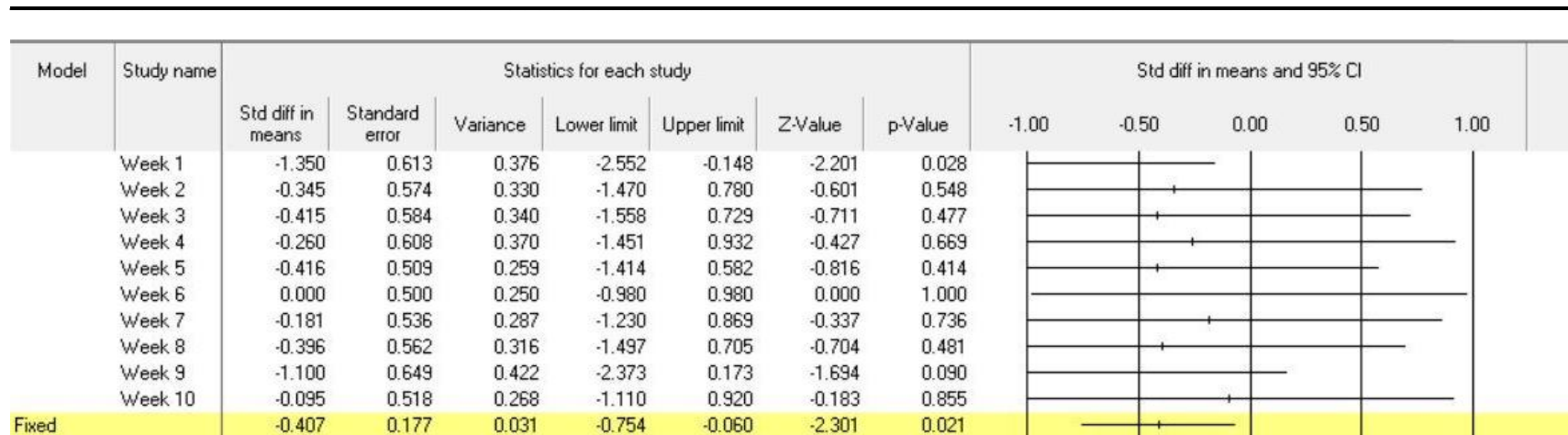


Figure 12: RASS Meta-Analysis Comparing Baseline-Passive and Baseline-Active Mean Differences. Negative Values favor Passive Intervention, Positive Values favor Active Intervention

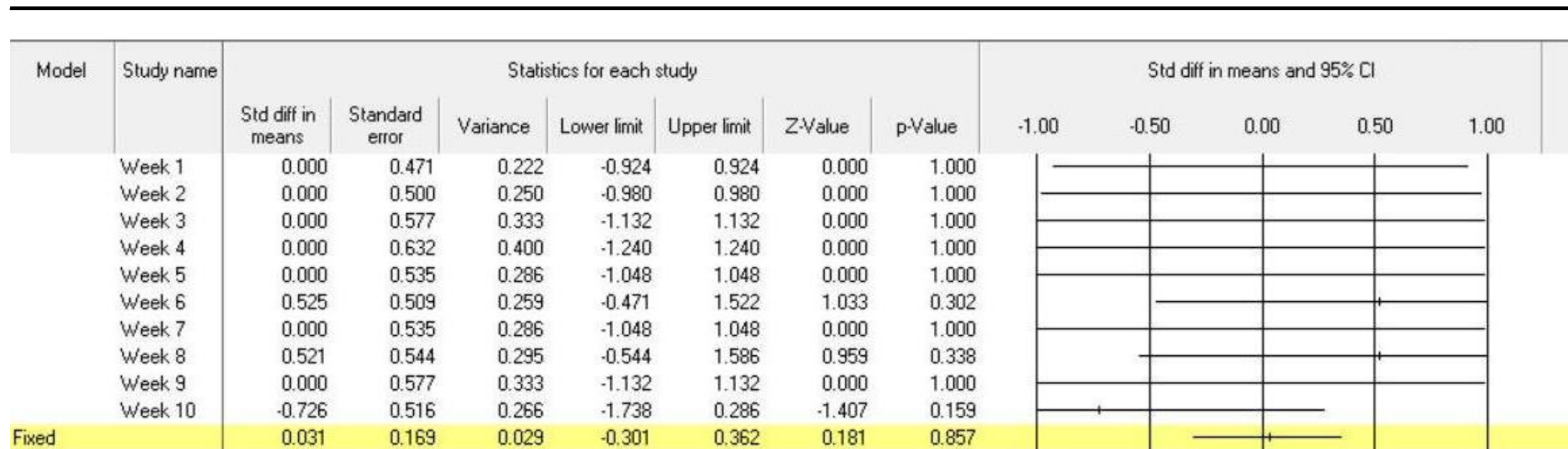


Figure 13: CMAI Physical Aggression Meta-Analysis for Active and Baseline Sessions. Negative Values favor Baseline, Positive Values favor Active Intervention

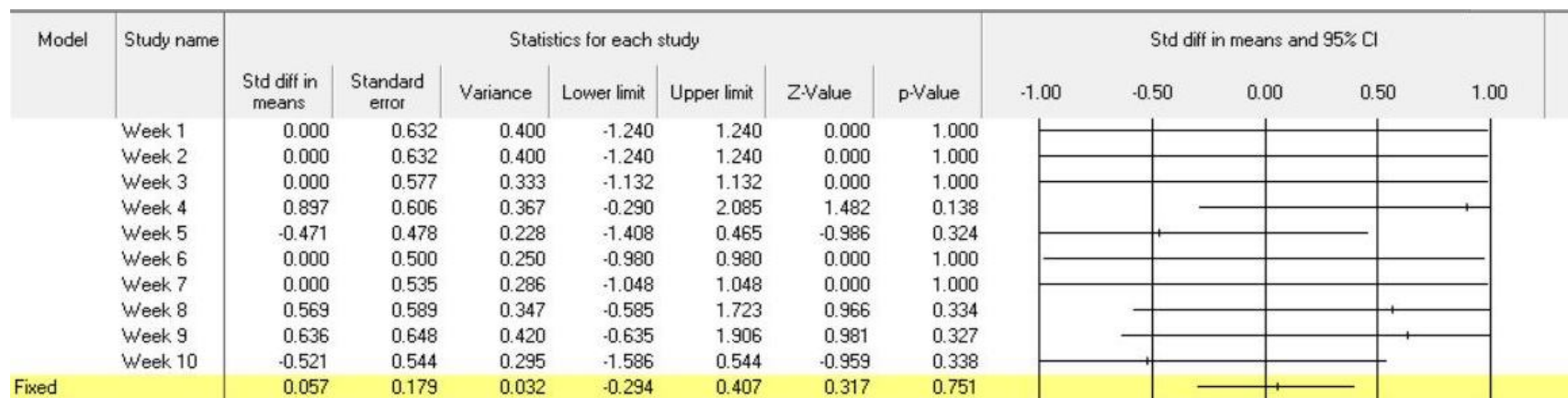


Figure 14: CMAI Physical Aggression Meta-Analysis for Passive and Baseline Sessions. Negative Values favor Baseline, Positive Values favor Passive Intervention

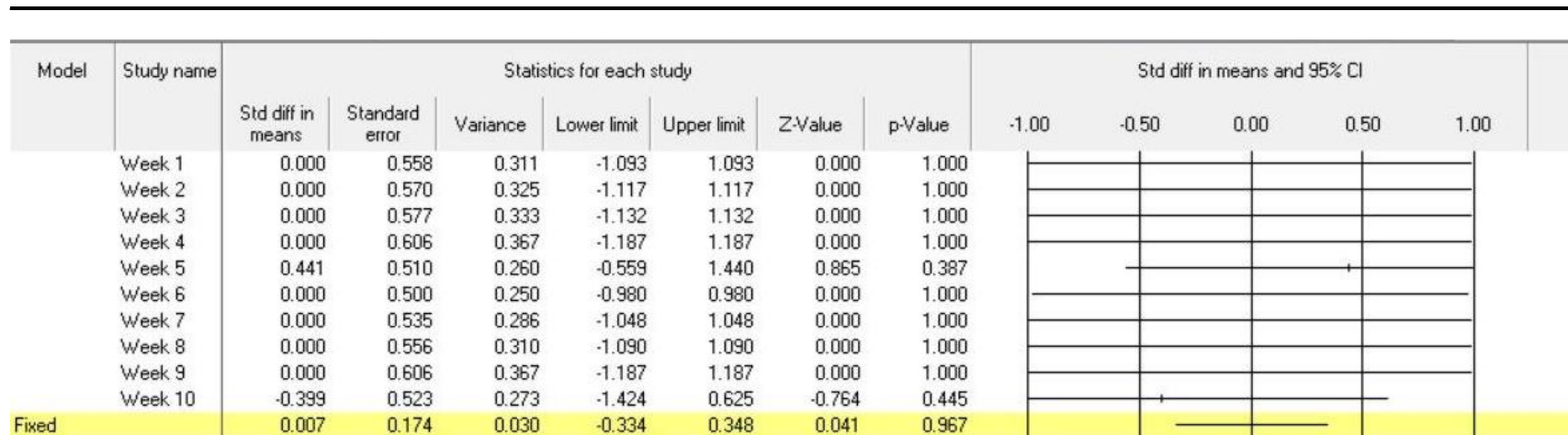


Figure 15: CMAI Physical Aggression Meta-Analysis Comparing Passive and Active Sessions. Negative Values favor Passive Intervention, Positive Values favor Active Intervention

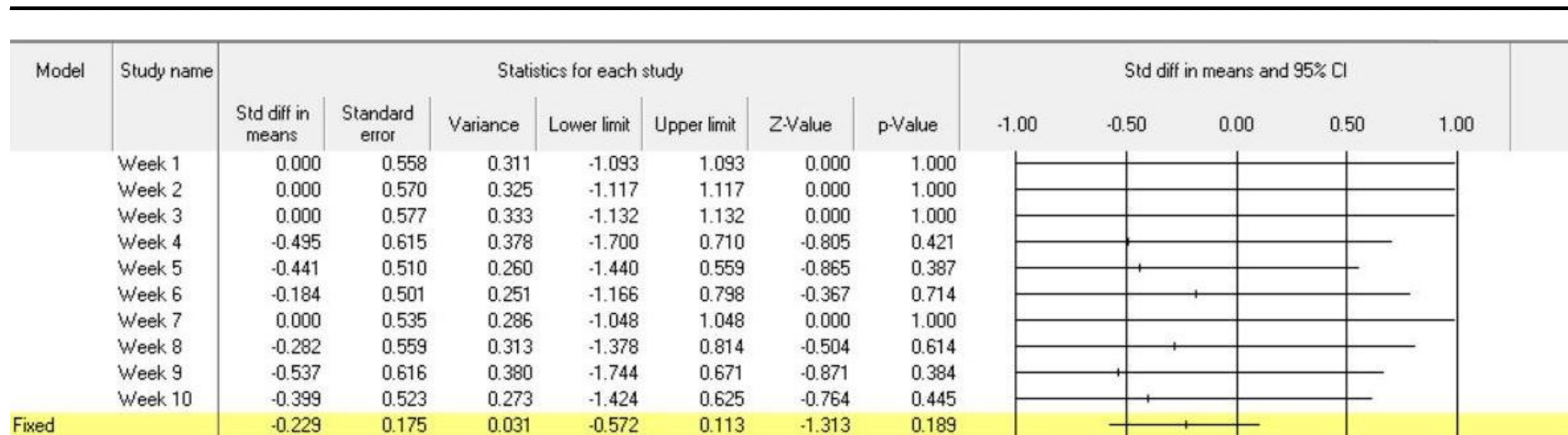


Figure 16: CMAI Physical Aggression Meta-Analysis Comparing Baseline-Passive and Baseline-Active Mean Differences. Negative Values favor Passive Intervention, Positive Values favor Active Intervention

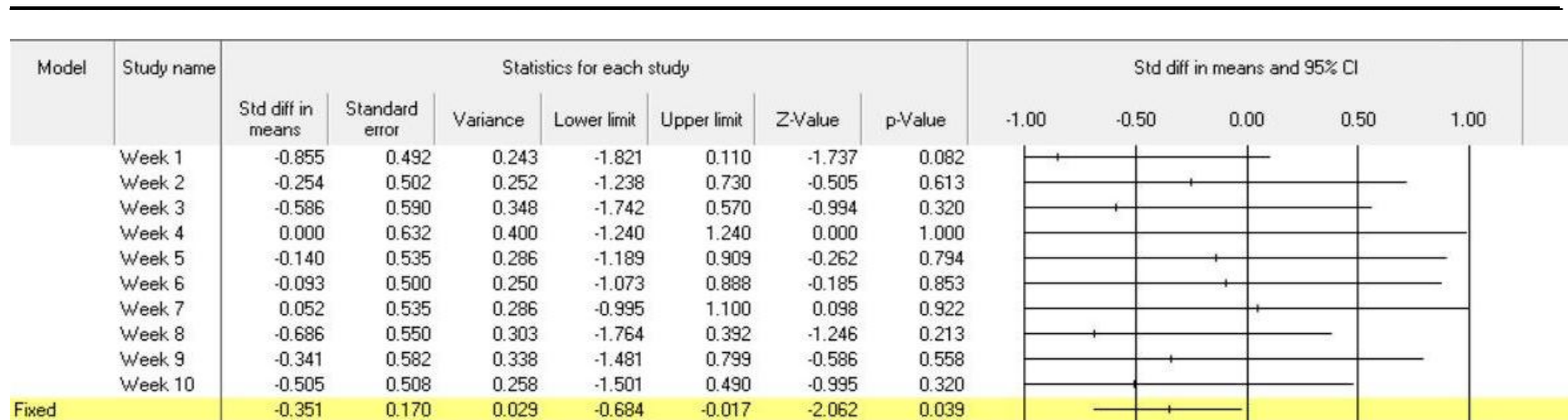


Figure 17: CMAI Physical Non-Aggressive Behaviors Meta-Analysis for Active and Baseline Sessions. Negative Values favor Baseline, Positive Values favor Active Intervention

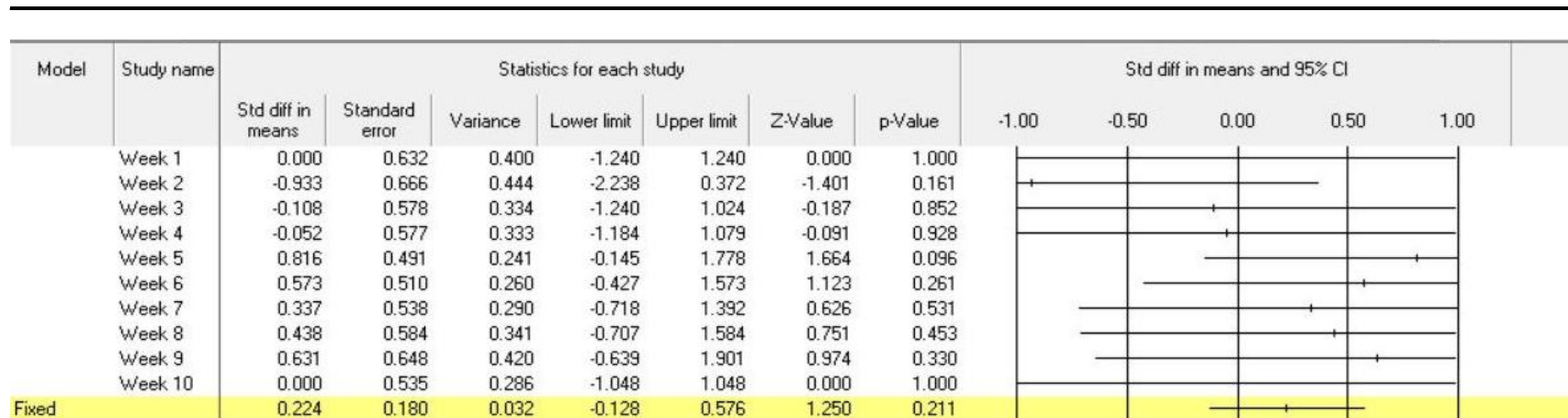


Figure 18: CMAI Physical Non-Aggressive Behaviors Meta-Analysis for Passive and Baseline Sessions. Negative Values favor Baseline, Positive Values favor Passive Intervention

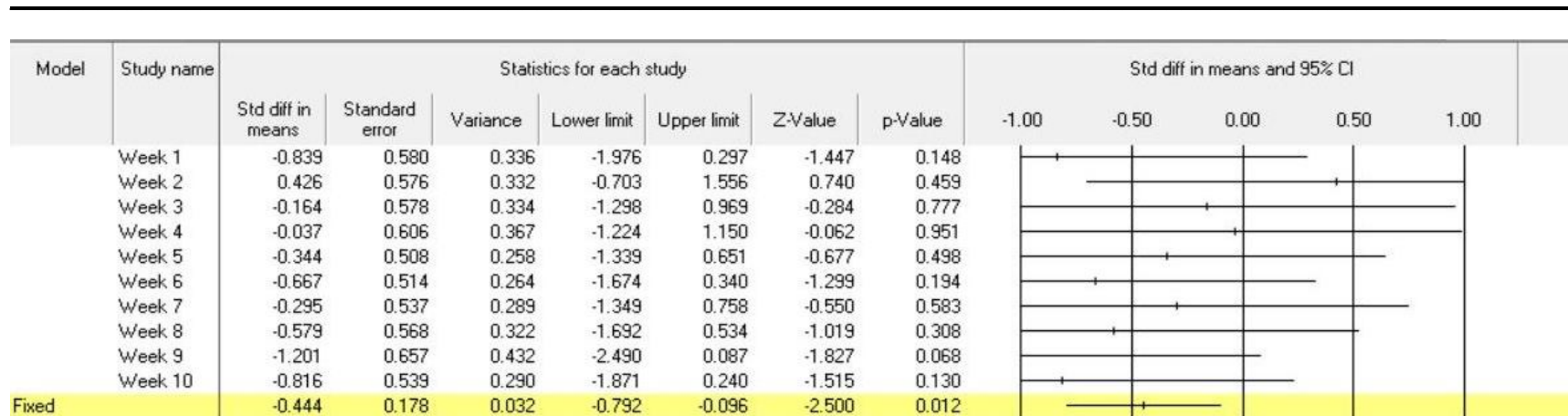


Figure 19: CMAI Physical Non-Aggressive Behaviors Meta-Analysis Comparing Passive and Active Sessions. Negative Values favor Passive Intervention, Positive Values favor Active Intervention

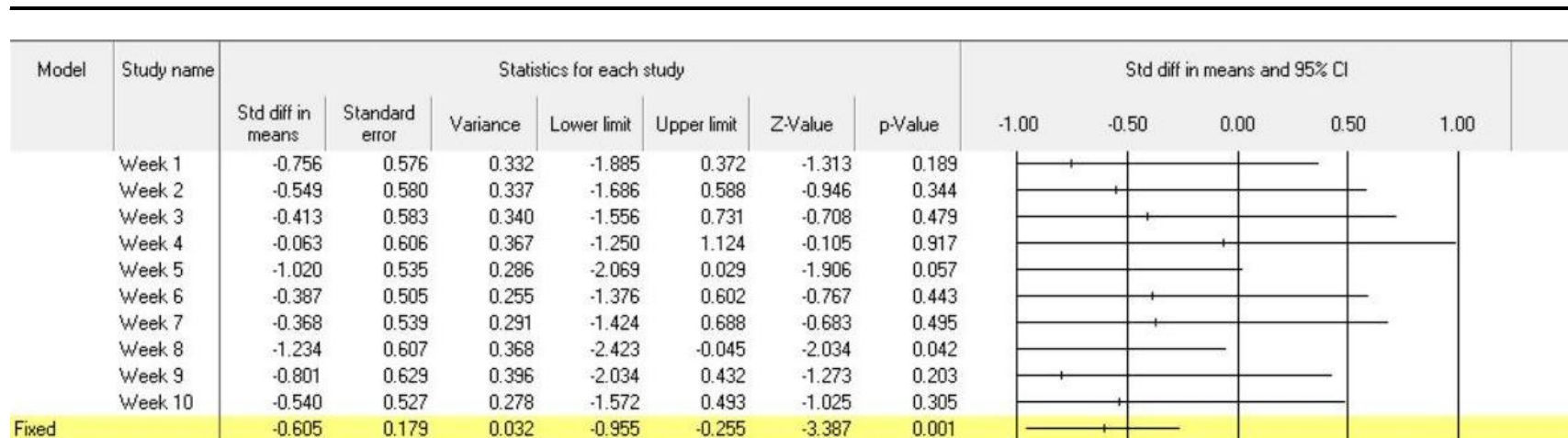


Figure 20: CMAI Physical Non-Aggressive Behaviors Meta-Analysis Comparing Baseline-Passive and Baseline-Active Mean Differences. Negative Values favor Passive Intervention, Positive Values favor Active Intervention

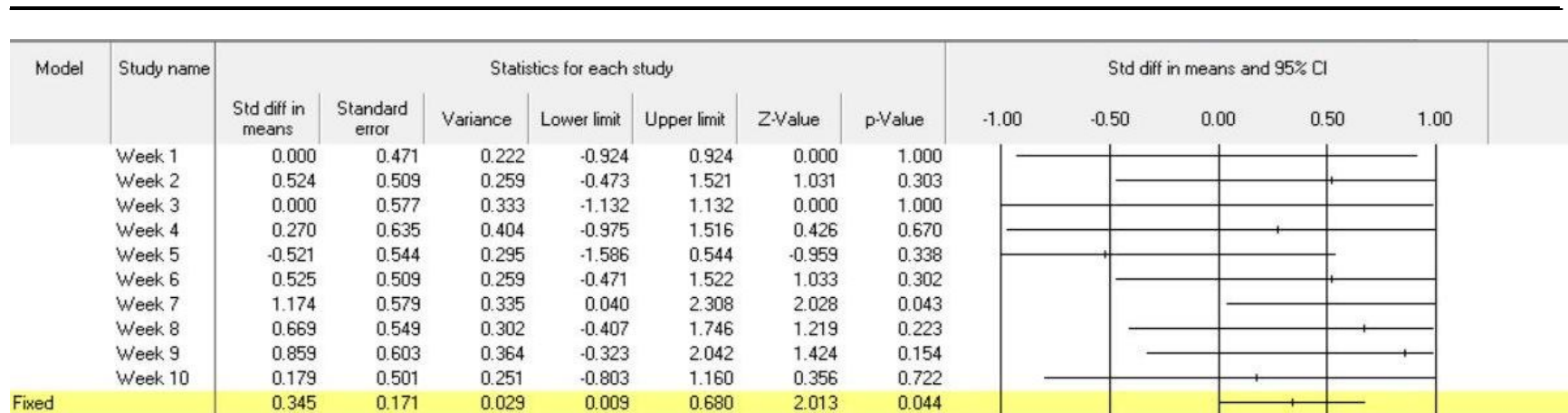


Figure 21: CMAI Verbal Behaviors Meta-Analysis for Active and Baseline Sessions. Negative Values favor Baseline, Positive Values favor Active Intervention

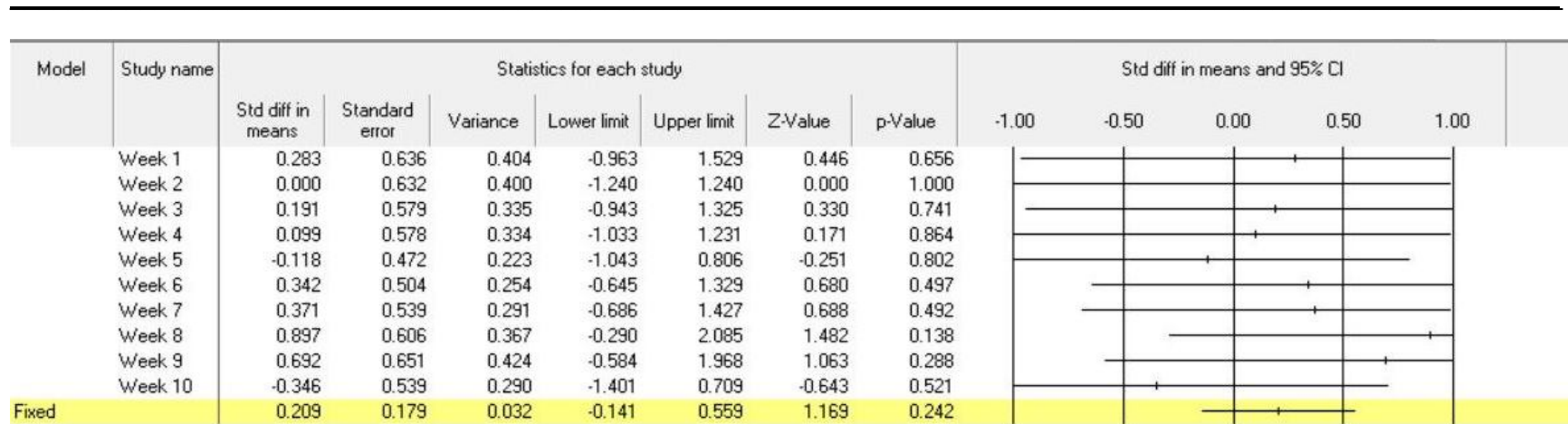


Figure 22: CMAI Verbal Behaviors Meta-Analysis for Passive and Baseline Sessions. Negative Values favor Baseline, Positive Values favor Passive Intervention

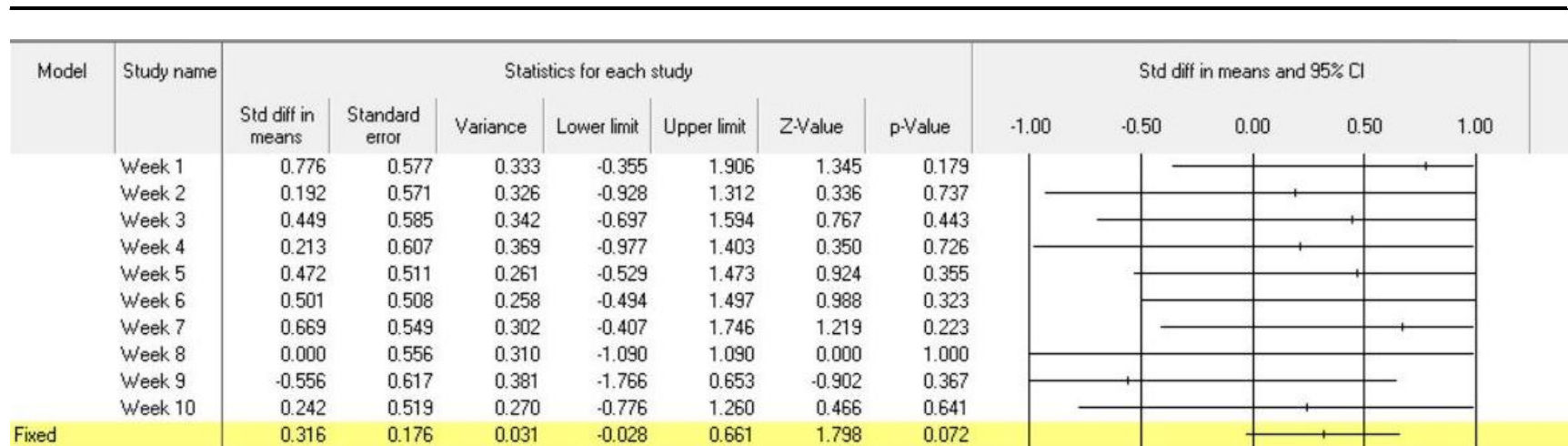


Figure 23: CMAI Verbal Behaviors Meta-Analysis Comparing Passive and Active Sessions. Negative Values favor Passive Intervention, Positive Values favor Active Intervention

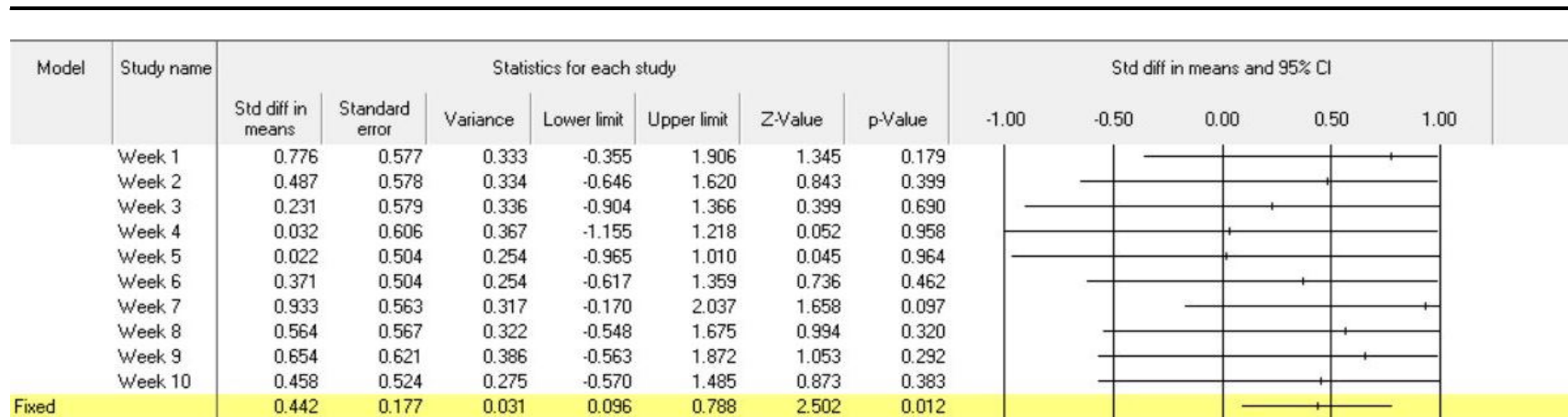


Figure 24: CMAI Verbal Behaviors Meta-Analysis Comparing Baseline-Passive and Baseline-Active Mean Differences. Negative Values favor Passive Intervention, Positive Values favor Active Intervention

CHAPTER 7: DISCUSSION

The current study aimed to examine the effects of participation in active and passive music interventions on agitated symptoms of AD and related dementias. Agitation in both active and passive music sessions was compared with baseline sessions without music using standard statistical methods, and to each other using meta-analysis techniques due to the non-independence of the groups (see Methodology in Chapter 5 for more information). Participation was measured during active music sessions and was tested for correlations with the agitation measures during these sessions. While participation was originally intended to be measured in the passive music interventions as well, virtually no participation was found during these sessions, and therefore correlations could not be made. This study relied on naturalistic observations of the effects of participation in music activities, and did not manipulate participants' daily routines in any way. The research design was quasi-experimental and used a convenience sample of people with AD who live at home and are cared for by an informal caregiver, and were already attending a daytime respite program 1 – 3 times per week that included the music interventions. The current research attempted to increase the generalizability of the effects of music interventions for people with dementia to a broader population, and also to examine the effects of participation and the type of intervention on agitation in order to illuminate best practices for caregivers, social workers, and others who regularly work with people with AD and related dementias as part of their treatment.

Results of Hypotheses

This study assessed the following hypotheses: 1) the level of music intervention (e.g., passive and active) will influence agitation differently in people with AD; 2) agitation is expected to be reduced during the interventions when compared to baseline measurements; 3)

greater participation (e.g., if participants sing or clap rather than simply listen) will result in greater reductions of agitation whether the intervention is active or passive; and 4) the active form of music intervention in which participation is encouraged will result in greater reductions in agitation than the passive form due to greater focus on the music and cognitive stimulation. How the results from this study either supported or did not support these four hypotheses is discussed below.

Hypothesis 1

Hypothesis 1 focused on the comparison of active and passive forms of music interventions and their ability to affect agitated symptoms in people with dementia differently. This is also directly connected to Hypothesis 4, which stated that the active form would have a greater effect on agitation than the passive form. The line graphs (Figures 1 - 8) in the previous chapter reveal that the passive interventions (see Figures 2, 4, 6, and 8) are consistently lower in agitation than are the active interventions versus their respective baselines (see Figures 1, 3, 5, and 7). While this result was not as expected, it is based purely on visual analysis of the graphs, and was not supported by further inferential analysis. Individual *t*-tests for each day of observation only revealed one result approaching significance of the *active* intervention for verbal agitation during week 7. This is likely due to the low power of the analyses due to treating each day as a separate experiment, and therefore having a very small sample size per day ($n = 5 - 10$).

Additional investigation of the data was done using meta-analysis in order to combine each day of observation and each type of intervention for comparison of the active and passive forms. This technique was utilized because of the non-independence of the groups receiving each intervention and to add additional power to each analysis by combining all 10 weeks of each

form in order to reveal an overall effect. These analyses revealed that the passive intervention was more effective in reducing agitation according to scores on the RASS, which measured overall agitation on a continuum with sedation as the opposite pole (i.e., negative scores). Although sedation may not have been the goal of the intervention, this analysis did not take this into consideration, and greater differences may have been found due to participants falling asleep during the passive intervention (see Figure 2). Additionally, for Physical Non-Aggressive behaviors on the CMAI, the passive music intervention was more effective than the active form (see Figures 19 and 20). While this is a strong effect in favor of the passive music intervention, it is important to note that the passive music intervention did not show a significant effect over baseline measurements (see Figure 18). This was also true of the previous effect on the RASS (see Figure 10). While both analyses supported the efficacy of the passive intervention over the baseline measurements, neither was statistically significant. The passive intervention may have been associated with lower agitation than the active form, but overall it was not effective according to these measures.

Consequently, Hypothesis 1 is supported by the abovementioned differences in active and passive forms of the intervention. The results of passive being favored for scores on the RASS and Physical Non-aggressive behaviors on the CMAI, and additionally, the active intervention being favored over passive and baseline measurements for Verbal agitated behaviors on the CMAI, clearly demonstrate the differences in the effects of passive and active music interventions on agitation in individuals with AD and related dementias.

Hypothesis 2

The one effect found that revealed the efficacy of the music interventions is that Verbal agitated behaviors on the CMAI were significantly lower than baseline measurements during the

active intervention (see Figure 21). This directly supports Hypothesis 2 that the music interventions will reduce agitation more so when compared to baseline measurements. However, this only supports the active form of the intervention, since significant differences were not found for the passive form over baseline measurements. Additionally, this only supports the active form for the Verbal agitated behaviors on the CMAI, since the baseline measurements were significantly *lower* than the active intervention for Physical Non-Aggressive behaviors (see Figure 17), and not significantly different for the Physical Aggression subscale (see Figure 13). Physical Non-Aggressive behaviors may have been higher during the active music sessions due to the general stimulating effect lively popular music can sometimes have on individuals, such as raising arousal levels, respiration, and heartbeat (Juslin & Vastfjall, 2008; Levitin & Tirovolas, 2009). That is, the intervention may not have only stimulated movements directly related to the music (e.g., clapping, tapping foot), but also may have stimulated movements interpreted as Physically Non-Aggressive agitated behaviors (i.e., repetitive motions not clearly connected to the rhythm, fidgeting, restlessness). Whether or not participants were engaged and actually singing along during the active sessions may also have contributed to this finding (see discussion of Hypothesis 3 below). While the active music intervention was not effective at reducing physical agitated symptoms overall, it was effective at reducing Verbal agitated behaviors, and thus partially supports Hypothesis 2.

Hypothesis 3

Hypothesis 3 stated that participation in the music interventions would affect agitation, with greater participation showing greater reductions in symptoms. Examining participant engagement could provide insight into the best methods of engaging clients in music interventions for caregivers, social workers, and others who care for people with dementia, and

therefore help them get the most out of the sessions. This hypothesis was supported by the significant negative correlation between overall verbal participation and the Physical Non-Aggressive behaviors subscale on the CMAI (see Table 4). While verbal participation may help regulate Physical Non-Aggressive behaviors, recall that overall the active sessions were not significantly different over baseline for these behaviors. What this means is that the people verbally participating (e.g., singing, humming, whistling) in the active intervention had lower Physical Non-Aggressive behaviors, but the others who were not participating had more of these behaviors, which apparently was enough to not only nullify any differences between the overall active and baseline measurements, but actually create the opposite effect of the baseline measurements being favored for these behaviors. Nonetheless, the strong negative correlation between verbal participation and Physical Non-Aggressive behaviors still partially supports Hypothesis 3, and also supports the necessity for engaging clients fully in the intervention in order for it to be effective.

It was also anticipated that participants who were singing during the active sessions would be less verbally aggressive, although the correlative analyses did not support this. The very weak, non-significant negative correlation between overall verbal participation and the Verbal agitation measure on the CMAI during the active sessions demonstrates that there was little effect. Additionally, examining correlations between verbal participation and Verbal agitation on a weekly basis further discredits this notion. Week 7 was the only weekly analysis that was even approaching significance, and it did not have the highest verbal participation (see Tables 3 and 5). Furthermore, Week 9, which had the lowest verbal participation, also had a reduction in Verbal agitation, although not significant (see Figure 7). Since Verbal agitated behaviors on the CMAI were found to be significantly reduced during the active music

interventions over the baseline measurements (see Figure 21), this means that participation probably did not greatly influence this measure. This effect is likely due to the greater focus on the music during the active intervention over the passive intervention, even when not participating. However, the strong correlation for verbal participation reducing Physical Non-Aggressive behaviors clearly demonstrates the importance of fully engaging clients when implementing active music interventions.

Hypothesis 4

The effect of the active music intervention reducing Verbal agitated behaviors on the CMAI also supports Hypothesis 4, stating that the active form will be more effective than the passive form at reducing agitation. Meta-analysis on the Verbal agitated behaviors subscale of the CMAI revealed that the active sessions showed a strong effect for significantly reduced agitation over the passive sessions, especially when using mean differences between intervention and baseline measurements (see Figure 23 and 24). This effect was anticipated since participants who were singing during the active sessions were assumed to not also be able to simultaneously be verbally aggressive, and furthermore, any verbal comments made during the active sessions may not have been able to be heard above the music and others' singing. However, the verbal participation during the active sessions each week did not necessarily support this idea (see discussion of Hypothesis 3 above). The greater cognitive stimulation and focus on the music during the active intervention versus the passive intervention, rather than participation, may be what cultivated this effect. The lower Verbal agitation during the active sessions as compared to the passive sessions does partially support Hypothesis 4, and also lends support to Gerdner's (1997) theory of music's ability of reducing stress by being the focal point during the intervention (discussed further in Implications below).

Additional Observations

Examining the participation in the active music intervention each week (see Table 3) revealed that the type of music, the protocol of implementation, and the setting may all affect verbal participation. For instance, week 9, which had the lowest verbal participation, consisted of only religious hymns, while the other weeks contained mostly popular music from the 1920's to the 1960's. Additionally, week 10's low verbal participation may have been due to the setting since it was the only session that was implemented outdoors. Looking at Figures 1, 3, and 5, reveal that overall agitation according to the RASS, and physical agitation on the CMAI, both aggressive and not aggressive, were higher during the active intervention than during baseline on week 10. Although this was not significant, mostly due to the low sample size, the marked increase could be explained by the outdoor setting since the performer had played before week 10, but indoors, and this effect was not seen. Additionally, baseline sessions were significantly favored over active sessions for overall Physical Non-Aggressive behaviors, with week 10 contributing to this effect. This demonstrates that an active music intervention implemented in an outdoor setting may increase physical agitated behaviors, possibly due to less focus on the music and an outdoor environment being more stimulating, as observed through participants' greater movements and activity, and music's known effect for being both cognitively and physically stimulating in general (Juslin & Vastfjall, 2008; Levitin & Tirovolas, 2009). However, in this case the abundance of stimuli other than the music in the outdoor setting may have created greater stress for the participants with AD, as Hall and Buckwalter's (1987) theory of the *Progressively Lowered Stress Threshold* in individuals with cognitive impairment posits.

Lastly, the performer and their varying methods of implementing the active music intervention may have also influenced participation. Variables such as performers talking to

participants and asking them questions between songs, whether the performer was facing the participants (e.g., when sitting and playing guitar) or facing the wall (e.g., when playing a piano against the wall), what songs were played, and the number and what participants were there each day all may have affected participation and the outcome of the music interventions. While participation was measured in the current study, these other abovementioned variables, while observed and noted, were not included in the analysis since they were not empirically measured.

Strengths and Limitations

The current study utilized strong research methodology which helped control for some possible confounds, and therefore contributed original knowledge to the field. The study focused on music therapy and musical activities and their utility in treating agitation associated with Alzheimer's disease (AD) and related dementias, and was methodologically unique from prior studies. Both active and passive forms of music therapy were utilized and compared, and participation and engagement with the interventions were also measured. The study also included a unique population of people with dementia who remained living at home during the course of the study.

Few studies of music's effects on agitation in people with dementia have been conducted using a true experimental design while incorporating a matched control group and random assignment with a large random sample to this author's knowledge. This is likely due to feasibility issues of such a study. One researcher (Janata, 2012) that attempted a true experimental design using random assignment of music exposure encountered diffusion of the treatment due to its being at a single location and, consequently, the control group had indirect exposure to the music (see Experimental Designs in Chapter 4 for more information). Feasibility issues such as this make it difficult to implement the "gold standard" of true experimental

designs when studying the effects of music on dementia in real-world situations. Therefore, like research in almost any field using human participants, prior research and the current study on music's effects on people with AD and related dementias suffers from multiple threats to both internal and external validity, including many confounding variables that may also influence agitation.

Internal and External Validity

While the one group, pre-post test design is relatively weak in controlling for validity issues when compared to true experimental designs, the enhanced methodology of the current study lent support for some of these concerns. First, the multiple observations for both the pre- and post tests (i.e., 40 total for baseline, passive, and active music sessions) over a ten-week period made this essentially an interrupted time series design, and potentially controlled for maturation, history, testing, regression, selection, and some additive and interactive effects of threats to internal validity (Shadish, Cook, & Campbell, 2002). The multiple baseline measurements were also a means of controlling for threats of history. Using multiple baseline measurements, any effect due to an historical event would be expected to reveal itself at around the same time in each participant. Therefore, it is easier to determine that a change seen in the participants' behavior may be due to an historical incident rather than to the intervention (Rubin & Babbie, 2008). Additionally, the multiple baseline and intervention measurements should have also helped control for maturation effects. If agitation increased due to the progression of AD in participants over the 10-week course of the study, this would appear during both the baseline measurement periods as well as the intervention measurement periods. If agitation only increased in the baseline measurements over time, it would reveal that the music interventions are more effective for participants with greater agitation levels. That is, if agitation continued to

increase over time during the course of the study in baseline measurements, but not in intervention measurements for the same participants, this would indicate that the intervention was having a greater effect reducing agitation when it is higher before the intervention is given. Utilizing multiple baseline measurements helped facilitate in giving a clear indication of what level of effect the music interventions were having on the participants.

The characteristic common to all baseline sessions in the current study was that they did not include music in the background. The baseline sessions did, however, involve a variety of group activities, including recreational games, some of which involved movement (e.g., balloon volleyball, bowling), and some of which involved relatively still activities, seated at tables (e.g., Bingo, Family Feud). This difference in movement during the baseline activities may have affected agitation in the participants. Those involving greater movement were likely more physically stimulating, and may have provoked more physical agitation, compared to activities done while sitting still. Additionally, the competitive recreational activities during some baseline sessions may have influenced physical aggression between participants.

The variability of activities during the baseline measurement periods presented the problem of obtaining a true baseline measurement of agitation in the participants in the current study since the other activities may have also influenced agitation. Some previous studies that have specifically compared the effects of music on agitation to other activities have found that the other activities can be just as effective as music at reducing agitated symptoms of dementia (e.g., Cooke et al., 2011, Gardiner & Furois, 2000, Snyder & Olson, 1996). Reading groups including discussion of the books (Cooke et al., 2011; Gardiner & Furois, 2000), and hand massage (Snyder & Olson, 1996) have both demonstrated effects of relaxation and reduced agitation in participants with dementia in prior studies. Additionally, Kasl-Godley and Gatz

(2000) theorize that the actual activity done is less important than the social interaction and cognitive stimulation provided by psychosocial interventions done in groups. This means that not finding a significant difference between music interventions and other activities does not necessarily mean that music is not effective; it may simply mean that the other activities are effective as well. The baseline measurements in the current study included a variety of other activities done in groups, and thus may have contributed to some of the non-significant results.

While utilizing multiple baseline measurements may have helped control for some of the variability in the current study, and also historical and maturation threats to internal validity, the issue of instrumentation was also a concern. Instrumentation issues with internal validity can be dealt with by utilizing multiple observers and demonstrating high inter-rater reliability in well-designed research studies (Rubin & Babbie, 2008). According to Ruben and Babbie (2008), an adequate level of agreement between multiple observers is one way to increase the accuracy of the data gathered by the observers, and therefore would decrease any instrumentation error. The current study utilized two observers and trained each in assessing both agitation and participation to ensure substantial inter-rater reliability (Cohen's Kappa = 0.61; Landis & Koch, 1977), before actually collecting the data used for the analyses. Additionally, the primary measures (e.g., RASS, CMAI) utilized for this study were standardized and had strong psychometric properties (see Measures in Chapter 5 for specifics).

Passive music sessions in the current study also varied in their activity level and their focus on the music, which may have affected their outcome. While some sessions had participants focused on the music (i.e., along with a slide show), others had participants engaging in conversation or other activities with music on in the background (e.g., drinking coffee, eating a snack, sitting in a circle to facilitate conversation). Prior studies on passive music's effects on

dementia have also varied their focus on the music, from simply having music playing in the background while dining (e.g., Hicks-Moore, 2005) to utilizing familiar, preferred music played in headphones placed on participants (e.g., Gerdner, 2005). These differences in the focus on the music during passive music interventions may influence agitation in the participants in both previous research and the current study. If the passive music interventions were kept consistent and included only sessions where participants paid full attention to the music, an overall effect of the passive music intervention over the baseline measurements may have been found in the current study. Unfortunately the researcher did not have control over this aspect of the intervention.

Another important limitation in this research on music interventions utilized for AD and related dementias is the sampling method. Like most of the prior studies of this type, this study used a convenience sample, in addition to a small sample size ($N = 22$), therefore weakening the external validity of the findings. Results from this study may not generalize beyond the sample and setting utilized since random selection was not used. Since studies of music therapy and music interventions in people with AD and related dementias commonly use convenience sampling methods (e.g., clients of a single respite center in this instance), results cannot be expected to generalize beyond the population in the setting for each study, even when utilizing random assignment to different groups as in the classic experimental design.

While generalizability is best with the utilization of random sampling, it is not always feasible. The current study used a convenience sample, and only had a single group, since participants were already exposed to both active and passive forms of music interventions at the respite center where the study was conducted. Additionally, the current research may have suffered from low representativeness of the broader population of people with AD since the

sample was drawn only from this one location. Since the researcher did not have control over these factors, external validity may have suffered. However, the participants with AD included in this study lived at home and were cared for by a family member, and not in assisted-living facilities or nursing homes, during the course of the study. This population has not been studied for the effects of music on their agitated symptoms of AD and related dementias except in one small, pilot study (i.e., Brotons & Marti, 2003) where participants stayed away from home in a rural setting with their primary caregiver (i.e., their spouse) during the study. While this study did show the effects of reduced agitation and anxiety from music in both caregivers and their recipients, being on vacation in a rural setting may have also contributed to the results. Since the effects of music on people with AD and related dementias who live at home during the course of the study have not been studied previously to this author's understanding, the current research expands the knowledge base of the effects of music interventions for people with dementia to a broader population of people with AD and related dementias who live at home while receiving respite services that include multiple psychosocial interventions including music.

Implications

Future Research

While prior research and the current study have found some reduced agitation symptoms when using music interventions for treating people with dementia, more research is still needed. Further research in the area should concentrate on the strength of the research design and the protocol of implementing the interventions. While true experimental designs are not always feasible, especially with vulnerable populations such as those with AD and related dementias, future research designs testing music interventions in this population should continue to strive

for this. Most prior research in the area, including the current study, lacked a true control group, which diminishes the validity of the study.

Additionally, the small sample sizes of most studies of this kind mean low power to find a moderate effect of music interventions in people with AD and related dementias. Most prior studies, including the current study, have also used convenience sampling methods in addition to small sample sizes, further weakening the validity of the findings. Future research in the area should aim for larger sample sizes and also random assignment and even random selection whenever possible.

Consistency in the implementation protocols of interventions is also likely to help with research fidelity in this area. This could include more control for the type of music and setting, and using prerecorded or even live music performers as-needed for agitation rather than at set times. Additionally, future research may want to compare active sessions with passive sessions in which participants are actually focused on the music rather than merely having music on in the background for a passive intervention. Consistency in the method and delivery of music interventions utilized for AD and related dementias across studies would help solidify the efficacy of these interventions and would also strengthen the validity of future studies.

Results from this study also lend support to the theoretical base in research on music interventions' effectiveness with reducing agitated dementia symptoms. Gerdner's (1997) mid-range theory of music's effects on agitation in people with AD is based on the increased effects of stress due to age-associated cognitive decline, which has been specifically applied to AD by Hall and Buckwalter (1987), who created the *Progressively Lowered Stress Threshold* (PLST; see Chapter 3 for further explanation). Gerdner's theory is based on the PLST theory but is specific to music's effects on AD. This study demonstrated that greater participation, and

therefore greater focus on the music, provided relief from some agitated symptoms of dementia, a result that directly supports this theory. Having a theoretical base in research of this type can not only help future researchers demonstrate that music interventions are effective for treating agitation in people with AD and other related dementias, but also build upon it and help explain how and why music may have this effect.

Practice Implications

The widespread use of music interventions by caregivers, social workers, and other practitioners working with people with AD and related dementias is partly explained because research has demonstrated music's efficacy in reducing some forms of agitation, and consequently disruptive behaviors, in this population. Results from this and previous studies on music's effects on dementia suggest that music interventions and activities involving music may provide both professional and informal caregivers a potential method of reducing agitation and disruptive behaviors in their care recipients that they could implement at home, and additionally for social workers and other practitioners to implement in respite and residential settings. Implementing music interventions can be as easy as playing recorded music to people suffering from dementia (i.e., a passive music intervention), although singing and/or playing simple instruments in a group and/or individual setting (i.e., an active music intervention), while more difficult to implement, may be more effective for the management of some symptoms. This could be as simple as caregivers singing familiar songs and encouraging their care recipients to sing along. Reducing the agitation and related behaviors associated with dementia improves the quality of life of both the persons with dementia and those around them, and music therapy and other music interventions can help facilitate this process.

This study demonstrated that the particulars of the music intervention, including the type of music, the setting, and the performer and their method of implementation, may make a difference in participation and therefore the effectiveness for reducing agitation. It is important for social workers and practitioners who utilize music and other psychosocial interventions to know how to maximally engage participants in the intervention. For instance, this study showed that sessions with popular music had much greater participation rates than a session with only hymns. Participants also showed more agitation in an outdoor setting rather than indoors, even with popular music. Additionally, the passive music intervention, which merely included having music on in the background, showed more consistently lower levels of agitation than the baseline measurements (see Figures 2, 4, 6, and 8 in Chapter 6), meaning caregivers and practitioners may simply need to play prerecorded preferred music for their recipients in order to reduce agitation. These results demonstrate the music intervention protocol is likely to be important in reducing agitation in people with AD and related dementias, and will allow caregivers, social workers, and others who treat the symptoms of the disease to utilize best practices when implementing this type of intervention.

There are many methods, including psychosocial interventions such as music therapy and other interventions involving music, which may help to temporarily prevent some symptoms once AD or other dementias have taken hold. Individualized, multidisciplinary treatment regimens, including psychosocial interventions that provide cognitive stimulation and social support such as group music interventions provide seem to be one of the finest treatments available for AD and other dementias at this time. Additionally, since music and other psychosocial interventions are effective at reducing agitated and aggressive behaviors in individuals with AD and other related dementias, they should be preferred over the common use

of sedative and antipsychotic medications and physical restraints. While medications or restraints may sometimes be necessary in extreme cases, treatment regimens for AD and related dementias can be maximized for efficacy by including psychosocial interventions, such as those including music. Furthermore, music therapists and other musicians are becoming increasingly more available to work with respite centers, residents of nursing homes or assisted-living facilities, and other settings and locations with older adults, including those suffering with AD and other dementias, in order to enhance and complement their current treatment regimens through the utilization of music interventions.

Policy Implications

Recent interest in non-pharmacological interventions by social workers and others who treat behavioral symptoms of AD and related dementias has grown vastly, widely due to the limitations of current medical treatment regimens, the side effects of medications, and the efficacy and relative ease of implementation of some psychosocial interventions (see treatment of Alzheimer's Disease in Chapter 2). Non-pharmacological treatments for dementia that are evidence-based, such as the use of music, should be included in treatment regimens since a multidisciplinary approach is required to effectively manage the cognitive and physical symptoms of the disease. The use of music through both passive listening and music groups involving active singing and playing have been implemented recently at many nursing homes, respite centers, and other care facilities for older adults around the world. For example, the Music and Memory program, which was created by Dan Cohen in 2010, has now grown to be implemented at over 3000 care facilities throughout the U.S. (Music and Memory, 2016). This program provides iPods to seniors filled with their preferred music (i.e., on a playlist if iPods are shared) so that they can enjoy listening to music through headphones at any time without

disturbing others. A recent study, yet unpublished, compared care facilities that have implemented the Music and Memory program with those that have not, and results showed improvements in behavioral symptoms and lowered antipsychotic medication use in residents at the facilities with the program (Music and Memory, 2016). This, the current study, and prior research on music's efficacy for treating behavioral symptoms of AD and related dementias points out music's usefulness as a part of multidisciplinary treatment regimens. Policy-makers need to be aware of interventions such as this in order to embrace them into local, state, and federal policies.

At the local level, organizations should stay focused on policies that implement evidence-based interventions such as the use of music for treating the agitated and other behavioral symptoms of dementia. Awareness of music's ability to reduce some symptoms of AD and related dementias is a prerequisite for the implementation of music programs, such as the Music and Memory program, at an organizational level. Research, such as the current study, raises the awareness of music's effectiveness for treating certain symptoms of dementia in individuals in care facilities. For instance, the director at the research site of the current study looked into and implemented the Music and Memory program as a direct result of the outcome of this study. However, music programs are usually only implemented when sufficient funding is available to organizations, and even after the programs are implemented, they often go unused or underutilized, or are implemented incorrectly. This is why organizational policies are needed regarding the types of music, and the settings and protocol for implementation of music interventions. This study and prior research point out that factors, such as individualizing the music, the setting of the intervention, and the consistency of which it is implemented, matter for maximizing the efficacy of music interventions for treating the behavioral symptoms of

dementia. Furthermore, the protocol of the implementation of music interventions for dementia may also vary by individuals. For example, someone who is currently agitated may not enjoy having headphones being placed on them, so their individualized, preferred music being played through speakers may be more effective and appropriate. Additionally, encouraging active participation such as singing or playing along on simple instruments may be more beneficial with certain types of agitation. Organizational policies regarding the exact use of music interventions and training for implementation of such programs are necessary to ensure that not only are music programs available to individuals with AD and related dementias, but that they are properly utilized.

On a broader scale, federal and state policies are necessary to fund music programs at care facilities such as nursing homes and respite centers throughout the U.S. Once more, awareness of music programs and their efficacy for treating symptoms of dementia is necessary in order for policy-makers to include them in policies regarding dementia treatment. Policies such as Medicare and Medicaid could cover the costs of music programs at care facilities for older adults through reimbursements to the organizations that implement music programs such as Music and Memory. Because both Medicare and Medicaid are joint programs between the federal government and each individual state, state policies along with federal policies must also address the issue of dementia treatment to include non-pharmacological interventions along with medical treatment. Research on music's effects on dementia, such as the current study, raises the awareness of evidence-based psychosocial interventions for dementia. For example, after the Music and Memory program was implemented at the research site, knowledge of the program grew to a state level with the Department of Health choosing to implement the program at 78 nursing homes and care facilities throughout the state. State and federal policies regarding the

treatment of AD and related dementias can determine whether individuals with the disease are able to receive necessary treatment, whether the treatment is in a community setting or in a nursing home, and exactly what treatments are made accessible. This has a direct influence on the availability of psychosocial interventions such as music programs for people with dementia, and policy-makers should include music and other evidence-based non-pharmacological interventions in funding treatment regimens for AD and related dementias. Unquestionably, the need for effective programs such as the Music and Memory program and other music-related programs to be included in treatment regimens for AD and related dementias will continue to grow as the population continues to age, and local, state, and federal policy-makers need to become more aware of music's importance, especially with its effects concerning dementia.

Conclusion

This study sought to examine the effects of both passive and active music interventions on the agitated behavioral symptoms associated with AD and related dementias. The analysis focused on the comparison of both types of music intervention and the effect of participation on agitation. Reduced agitation in the active intervention over the passive intervention, and in both interventions over the baseline measurements was anticipated. Results show that verbal participation was associated with reduced Physical Non-aggressive behaviors during the active intervention as expected. Additionally, Verbal agitated behaviors were also reduced during the active intervention over baseline measurements. Unanticipated results include the passive intervention being favored over the active; however, the passive intervention did not demonstrate a significant effect over the baseline measurements. Also unexpectedly, baseline measurements illustrated greater reductions in Physical Non-aggressive behaviors over the active intervention

despite the strong correlation between verbal participation and Physical Non-aggressive behaviors.

Findings suggest that verbal participation (e.g., singing, humming, whistling) in an active music intervention does help regulate Physical Non-aggressive agitated behaviors in individuals with AD and related dementias. However, people not verbally participating had greater Physical Non-aggressive behaviors, creating the effect of favoring the baseline measurements over the active intervention. This clearly demonstrates that it is important to fully engage participants and encourage verbal participation in active music interventions for maximum efficacy. Additionally, the reduced Verbal agitation during the active intervention illustrates the greater efficacy of active music interventions over passive. The greater focus on the music and the additional cognitive stimulation participation in an active intervention provides over a passive one probably produced this effect. However, results also indicate reduced Verbal agitation for people who were not necessarily verbally participating in the active intervention as well. This is likely due to being more focused on the music during the active intervention versus the passive intervention, which mostly only included music playing in the background during other activities. Since the baseline measurements also included other activities, but did not have music on in the background, no effect of the passive music intervention was found. Had the passive intervention included greater focus on the music, an effect may have been found.

The current study also adds to the field of knowledge about music's effects on AD and related dementias, especially regarding the implementation of music interventions and the effects on specific types of agitation. While only certain types of agitated symptoms were reduced, this study demonstrated that active verbal participation is important to the intervention's efficacy. It also demonstrated that the setting and the type of music may make a difference when

implementing music interventions in a group, and that interventions should be kept consistent with the primary focus on the music whenever possible. Additionally, this study strengthens the theoretical base in research on music interventions' efficacy of reducing agitated behavioral symptoms in individuals with AD and related dementias by demonstrating the effects of active music interventions and backing up the theory of the effect of music as the focal point and thus reducing the stress of trying to comprehend other environmental stimuli concurrently (Gerdner, 1997; Hall & Buckwalter, 1987). A robust theoretical base in research regarding music's effects on dementia can help strengthen the existing theories and help advance further, more complex models and explanations of how and why music has an effect.

Lastly, the use of music interventions to treat agitated behavioral symptoms of dementia has become widely implemented at many care facilities for older adults both nationwide and around the globe. Policy-makers should include any non-pharmacological treatments for dementia that are evidence-based since a multidisciplinary approach is required to effectively manage the symptoms of the disease. This includes the use of music by means of both passive listening, with programs such as Music and Memory, and music groups involving active singing and playing that have been implemented at many nursing homes, respite centers, and other care facilities for older adults. Frequently, music programs such as these are only implemented when sufficient funding is available to organizations, and even after programs are implemented through federal, state, or local policies, they often go unused or underutilized. While federal and state policies may be necessary to fund music programs at care facilities for older adults, organizational policies regarding the use and training for implementation of such programs at a local level are necessary to ensure that not only are music programs available to individuals with AD and related dementias, but that they are properly utilized.

The use of music interventions to reduce agitation and improve, especially in the short-term, wellbeing among individuals with AD and other related dementias looks promising. However, additional research with improved internal and external controls - especially to reduce measurement errors, improve intervention/treatment fidelity, and improve external validity and generalizability - is needed. Improved research designs and methodologies will assist scholars in their efforts to delineate such things as the effects associated with active versus passive music interventions, and the effects associated with individualized versus classical or other non-individualized music interventions. These methodological improvements may not only help scholars to elaborate on a theoretical basis for the beneficial influences of music therapy on AD individuals, but could very well improve multidisciplinary treatment regimens for AD suffers, AD treatment effectiveness, and the overall wellbeing of AD individuals.

REFERENCES

- Alzheimer's Association (2012). *Alzheimer's disease: 2011 facts and figures*. Retrieved from <http://www.alz.org/documents/factfigures.pdf>
- Alzheimer's Association (2011). *Alzheimer's disease: 2010 world report*. Retrieved from <http://www.alz.org/documents/worldreport.pdf>
- Alzheimer's Association and National Alliance for Caregiving (2004). *Families Care: Alzheimer's Caregiving in the United States, 2004*. Retrieved from <http://www.alz.org>
- Andrade, P., & Bhattacharya, J. (2003). Brain tuned to music. *Journal of the Royal Society of Medicine*, 96, 284-287.
- Baker F. (2001). The effects of live, taped, and no music on people experiencing posttraumatic amnesia. *Journal of Music Therapy*, 38(3), 170-92.
- Baker, F., and Tamplin, J. (2006). *Music therapy methods in neurorehabilitation: A clinician's manual*. London: Jessica Kingsley Publishers.
- Berrios, G. (1990). Alzheimer's disease: A conceptual history. *International Journal of Geriatric Psychiatry*, 5, 355-365.
- Bible, online version. Retrieved from www.bible.com.
- Blazer, D. (2013). Neurocognitive disorders in DSM-5. *American Journal of Psychiatry*, 170, 585-587. doi:10.1176/appi.ajp.2013.13020179
- Bonde, L. (2007). Music as metaphor and analogy. *Nordic Journal of Music Therapy*, 16, 60-81.
- Brotons, M., & Marti, P. (2003). Music therapy with Alzheimer's patients and their family caregivers: A pilot project. *Journal of Music Therapy*, 40 (2), 138.

- Brotons, M. & Pickett-Cooper, P. (1996). The effects of music therapy intervention on agitation behaviors of Alzheimer's disease patients. *Journal of Music Therapy*, 33 (1), 2–18.
- Brattico, E., Alluri, V., Bogert, B., Jacobson, T., Vartiainen, N., Nieminen, S., & Tervaniemi, M. (2011). A fMRI study of happy and sad emotions in music with and without lyrics. *Frontiers in psychology*, 2, 1-16.
- Bruhn, H. (2002). Musical development of elderly people. *Psychomusicology*, 18, 59-75.
- Bruscia, K. E. (1998). *Defining Music Therapy*. Gilsum, NH: Barcelona Publishers.
- Cairns, R., Evans, J., and Prince, M. (2005). The impact of NICE guidelines on diagnosis and treatment of Alzheimer's disease. *International Journal of Geriatric Psychiatry*, 19, 800-806.
- Carruth, E. (1997). The effects of singing and the spaced retrieval technique on improving face-name recognition in nursing home residents with memory loss. *Journal of Music Therapy*, 34, 165-186.
- Chapman, S., Weiner, M., Rackley, A., Hynan, L., and Zientz, J. (2004). Effects of cognitive-communication stimulation for Alzheimer's disease patients treated with Donepezil. *Journal of Speech, Language, and Hearing Research*, 47, 1149-1163.
- Clark, M., Lipe, A., & Bilbrey, M. (1998). Use of music to decrease aggressive behavior in people with dementia. *Journal of Gerontological Nursing*, 24, 10-17.
- Cohen-Mansfield, J. (1997). Conceptualization of agitation: Results based on the Cohen-Mansfield Agitation Inventory and the Agitation Behavior Mapping Instrument. *International Psychogeriatrics*, 8, 309-315. doi:10.1017/S1041610297003530
- Congreve, W. (1697). *The mourning bride: A tragedy*. Google books. Retrieved from books.google.co.uk.

- Cooke, M., Moyle, W., Shum, D., Harrison, S., & Murfield, J. (2011). A randomized controlled trial exploring the effect of music on agitated behavior and anxiety in older people with dementia. *Aging and Mental Health, 14*, 905-916. doi: 10.1080/13607861003713190
- Cross, I. & Morley, I. (2008). The evolution of music: theories, definitions and the nature of the evidence. In Stephen Malloch & Colwyn Trevarthen (Eds.), *Communicative musicality*, (pp61-82) Oxford: Oxford University Press.
- Darnley-Smith, R. & Patey, M. (2003). *Music Therapy*. London; Sage Publications Ltd.
- Darwin, C. (1871/1998). *The descent of man* (reprint). London: Murray.
- Evans, S. (2008). Beyond Forgetfulness: How psychoanalytic ideas can help us understand the experience of patients with dementia. *Psychoanalytic Psychotherapy, 22*, 155-176.
- Foster, N. & Valentine, E. (1998). The effect of concurrent music on autobiographical recall in dementia of the Alzheimer's type. *Musicae Scientiae, 2*, 143-155.
- Gardiner, J. & Furois, M. (2000). Music therapy and reading as intervention strategies for disruptive behavior in dementia. *Clinical Gerontologist, 22*(1), 31-46. Retrieved from Health Source: Nursing/Academic Edition database.
- Gerdner, L. (1997). An individualized music intervention for agitation. *Journal of the American Psychiatric Nurses Association, 3*, 177-184.
- Gerdner, L. (2001). The effects of individualized music vs. classical music on agitation in elderly persons with Alzheimer's disease. *International Psychogeriatrics, 12*, 49-65.
- Gerdner, L. (2005). Use of individualized music by trained staff and family: Translating research into practice. *Journal of Gerontological Nursing, 31*(6), 22-30.
- Gerdner, L. & Swanson, E. (1993). Effects of individualized music on agitated elderly patients. *Archives of Psychiatric Nursing, 7*, 284-291.

- Gotell, E., Brown, B., & Ekman, S. (2009). The Influence of Caregiver Singing and Background Music on Vocally Expressed Emotions and Moods in Dementia Care: A Qualitative Analysis. *International Journal of Nursing Studies*, 46, 422-430.
- Grant, W. B. (1997). Dietary links to Alzheimer's disease. *Alzheimer's Disease Review*, 6, 151-164.
- Hall, G. & Buckwalter, K. (1987). Progressively lowered stress threshold: A conceptual model for care of adults with Alzheimer's disease. *Archives of Psychiatric Nursing*, 1, 399-406.
- Jack, C., Albert, M., Knopman, D, McKhann, G., Speling, R., Carillio, M., Thies, B., & Phelps, C. (2011). Introduction to the recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. *Alzheimer's & Dementia*, 7, 257-262.
- Johnsen E., Trenel D., Lutgendorf, S., & Adolphs, R. (2009). A neuroanatomical dissociation for emotion induced by music. *Psychophysiology*, 72, 24-33.
- Juslin, P. & Vastfjall, D. (2008). Emotional responses to music: The need to consider underlying mechanisms. *Behavioral and brain sciences*, 31, 559-621.
- Hall, G. & Buckwalter, K. (1987). Progressively lowered stress threshold: A conceptual model for care of adults with Alzheimer's disease. *Archives of Psychiatric Nursing*, 1, 399-406.
- Hargreaves, D & North, A. (1999). The functions of music in everyday life: Redefining the social in music psychology. *Psychology of Music*, 27, 71-83.
- Herbert, L & Scerr, P. (2003). Alzheimer's disease in the U.S. population. *Archives of Neurology*, 60, 1119-1122.

- Hicks-Moore, S. (2005). Relaxing music at mealtimes in nursing homes: Effects on agitated patients with dementia. *Journal of Gerontological Nursing*, 31, 26-32.
- Janata, P. (2012). Effects of widespread and frequent personalized music programming on agitation and depression in assisted-living facility residents with Alzheimer's-type dementia. *Music and Medicine*, 4, 8-15. doi: 10.1177/1943862111430509
- Kasl-Godeley, J & Gatz, M. (2000). Psychosocial interventions for individuals with dementia. *Clinical Psychology Review*, 20, 755-782.
- Kneafsey, R. (1997). The therapeutic use of music in care of the elderly setting: A literature review. *Journal of Clinical Nursing*, 6(5), 341-6.
- Koelsch, S. (2010). Towards a neural basis of music-evoked emotion. *Trends in cognitive sciences*, 14, 131-137.
- Koelsch, S. (2009). A neuroscientific perspective on music therapy. *Neurosciences and music III: Disorders and plasticity*, 1169, 364-374.
- Ledger, A., & Baker, F. (2007). An investigation of long-term effects of group music therapy on agitation levels of people with Alzheimer's Disease. *Aging & Mental Health*, 11(3), 330-338. doi:10.1080/13607860600963406
- Lee, K., & Baker, F. (1997). Towards integrating a holistic rehabilitation system: The implications for music therapy. *Australian Journal of Music Therapy*, 8, 30-37.
- Levitin, D., & Tirovolas, A. (2009). Current advances in the cognitive neuroscience of music. *The year in cognitive neuroscience*, 2009, 211-231.
- Lowis, M. (2010). Emotional responses to music: A review. *Journal of applied arts and health*, 1, 81-92.
- Mandell, A. & Green, R. (2011). Alzheimer's disease: History. In A. Budson & N. Kowall (Eds.)

- The handbook of Alzheimer's disease and other dementias*. Blackwell Publishing, Ltd.
- Matthews B., Chang C., May, M., Engstrom J., & Miller, B. (2009). Pleasurable emotional response to music: *Neurocase*, 15, 248-259.
- Maurer, K., Yolk, S. & Gerbaldo, H. (1997). Auguste D. and Alzheimer's disease. *Lancet*, 349, 1546-1549.
- McKhann, G., Knopman, D., Cherkow, H., Hyman, B., Jack, C., Kawas, C., Klunk, W., ... Phelps, C. (2011). The diagnosis of dementia due to Alzheimer's disease: Recommendations from the National Institute on Aging and the Alzheimer's Association workgroup. *Alzheimer's & Dementia*, 7, 263-269.
- Music and Memory (2016). *Another Music and Memory milestone: 3K certified organizations and counting*. Retrieved from www.musicandmemory.org/blog October, 2016.
- National Institute on Aging (2011). *Understanding Alzheimer's disease: What you need to know*. Retrieved from <http://www.nia.nih.gov/sites/default/files/UnderstandingADfinal.pdf>
- National Institute on Aging & National Institutes of Health (2011). *Alzheimer's disease: Unraveling the mystery*. Retrieved from http://www.nia.nih.gov/sites/default/files/Unraveling_final.pdf
- Omar, R., Hailstone, J., Warren, J., Crutch, S., & Warren, J. (2010). Cognitive organization of musical knowledge: A clinical analysis. *Brain*, 133, 1200-1213.
- Peters, J. S. (2000) *Music Therapy: An Introduction (2nd Ed)*. Springfield: Charles C. Thomas
- Ragneskog, H., Asplund, K., Kihlgren, M. & Norberg, A. (2001). Individualized music played for agitated patients with dementia: analysis of video-recorded sessions. *International Journal of Nursing Practice* 7, 146-155.
- Richter, R., and Richter, B. (2004). *Alzheimer's Disease: A Physician's Guide to*

- Practical Management*. Humana Press, New Jersey.
- Rodriguez, G., De Leo, C., Girtler, N., Vitali, P., Grossi, E., & Nobili, F. (2003). Psychological and social aspects in management of Alzheimer's patients: an inquiry among caregivers. *Neurological Sciences*, 24(5), 329-335. doi:10.1007/s10072-003-0184-1
- Sacks, O. (2008). *Musicophilia: Tales of music and the brain*. Knopf: NY
- Schäfer, T., & Sedlmeier, P. (2009). From the functions of music to music preference. *Psychology of Music*, 37, 279-300.
- Schorr, A. (1993). Music and pattern change in chronic pain. *Advances in Nursing Science* 15(4), 27–36.
- Scott, J., Roberto, K., Hutton, J., & Slack, D. (1985). Family conflicts in caring for the Alzheimer's patient. In J.T. Hutton & A.D. Kenny (Eds.), *Senile dementia of the Alzheimer's type* (pp. 77-86). New York: A.R. Liss.
- Sessler, C., Gossler, M., Grap, M., O'Neal, P., Keane, K., & Elswik, R. (2002). The Richmond Agitation–Sedation Scale: Validity and reliability in adult intensive care unit patients. *American Journal of Critical Care Medicine*, 166, 1338-1344. doi: 10.1164/rccm.2107138
- Snyder, M., Olson, J. (1996). Music and hand massage interventions to produce relaxation and reduce aggressive behaviors in cognitively impaired elders: A pilot study. *Clinical Gerontologist*, 17, 64-69.
- Spiro, N. (2010). Music and dementia: Observing effects and searching for underlying theories. *Aging and Mental Health*, 14, 891-899.
- Sung, H. C. & Chang, A. M. (2005) Use of preferred music to decrease agitated behaviors in

- older people with dementia: A review of the literature. *Journal of Clinical Nursing* 14(9):pp. 1133-1140.
- Sung, H., Chang, A. & Abbey, (2006). The effects of music on agitation in older people with dementia in Taiwan. *International Journal of Geriatric Psychiatry*, 21, 999-1000.
- U.S. Department of Health and Human Services (2011). *2010 Alzheimer's disease progress report: A deeper understanding*. Retrieved from http://www.nia.nih.gov/sites/default/files/2010_progress_report_2.pdf
- Wan, C. & Schaug, G. (2010). Music making as a tool for promoting brain plasticity across the lifespan. *Neuroscientist*, 16, 566-577.
- Whipple, J. (2004). Music in intervention for children and adolescents with autism: A meta-analysis. *Journal of Music Therapy*, 41, 90-106.
- Wigram, T. & Gold, C. (2006). Research evidence and clinical applicability of music therapy for autism spectrum disorder. *Child Care: Health and development* 32, 535-542.
- Williams J., Plassman B., Burke J., Holsinger T., & Benjamin S. (2010). *Evidence report/technology assessment No. 193: Preventing Alzheimer's disease and cognitive decline*. Rockville, MD: Agency for Healthcare Research and Quality.
- Witzke, J., Rhone, R., Backhaus, D., & Shaver, N. (2008). How sweet the sound: Research evidence for the use of music in Alzheimer's dementia. *Journal of Gerontological Nursing*, 34(10), 45-52. Retrieved from MEDLINE database.

APPENDIX A: COHEN MANSFIELD AGITATION INVENTORY

Cohen-Mansfield Agitation Inventory (CMAI)

Instructions: For each of the behaviors below, check the rating that indicates the average frequency of occurrence over the last 2 weeks.

Behavior	Never 1	Less Than Once a Week 2	Once or Twice a Week 3	Several Times a Week 4	Once or Twice a Day 5	Several Times a Day 6	Several Times an Hour 7
1. Hitting (including self)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Kicking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Grabbing onto people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Pushing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Throwing things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Biting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Scratching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Spitting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Hurt self or others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Tearing things or destroying property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Making physical sexual advances	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Paces, aimless wandering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Inappropriate dress or disrobing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Trying to get to a different place. .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Intentional falling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Eating/drinking inappropriate substances	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Handling things inappropriately	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Hiding things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Hoarding things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Performing repetitious mannerisms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. General restlessness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Screaming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Making verbal sexual advances ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Cursing or verbal aggression	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Repetitive sentences or questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Strange noises (weird laughter or crying)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Complaining	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Negativism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Constant unwarranted request for attention or help	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Name of Rater: _____

Name of Primary Caregiver/Informant: _____

Note: This is the nursing-home, long version of the Cohen-Mansfield Agitation Inventory. For definitions of the behaviors, administration, scoring information, and other versions, please consult the manual.

Reprinted with permission from Jiska Cohen-Mansfield, PhD, Research Institute of the Hebrew Home of Greater Washington.

APPENDIX B: RICHMOND AGITATION-SEDATION SCALE

Richmond Agitation Sedation Scale (RASS) *

Score	Term	Description	
+4	Combative	Overtly combative, violent, immediate danger to staff	
+3	Very agitated	Pulls or removes tube(s) or catheter(s); aggressive	
+2	Agitated	Frequent non-purposeful movement, fights ventilator	
+1	Restless	Anxious but movements not aggressive vigorous	
0	Alert and calm		
-1	Drowsy	Not fully alert, but has sustained awakening (eye-opening/eye contact) to <i>voice</i> (≥ 10 seconds)	Verbal Stimulation
-2	Light sedation	Briefly awakens with eye contact to <i>voice</i> (< 10 seconds)	
-3	Moderate sedation	Movement or eye opening to <i>voice</i> (but no eye contact)	
-4	Deep sedation	No response to voice, but movement or eye opening to <i>physical</i> stimulation	Physical Stimulation
-5	Unarousable	No response to <i>voice or physical</i> stimulation	

Procedure for RASS Assessment

1. Observe patient
 - a. Patient is alert, restless, or agitated. **(score 0 to +4)**
2. If not alert, state patient's name and *say* to open eyes and look at speaker.
 - b. Patient awakens with sustained eye opening and eye contact. **(score -1)**
 - c. Patient awakens with eye opening and eye contact, but not sustained. **(score -2)**
 - d. Patient has any movement in response to voice but no eye contact. **(score -3)**
3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum.
 - e. Patient has any movement to physical stimulation. **(score -4)**
 - f. Patient has no response to any stimulation. **(score -5)**

* Sessler CN, Gosnell M, Grap MJ, Brophy GT, O'Neal PV, Keane KA et al. The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care patients. *Am J Respir Crit Care Med* 2002; 166:1338-1344.

* Ely EW, Truman B, Shintani A, Thomason JWW, Wheeler AP, Gordon S et al. Monitoring sedation status over time in ICU patients: the reliability and validity of the Richmond Agitation Sedation Scale (RASS). *JAMA* 2003; 289:2983-2991.

APPENDIX C: INSTITUTIONAL REVIEW BOARD APPROVAL

ACTION ON PROTOCOL CONTINUATION REQUEST



Institutional Review Board
Dr. Dennis Landin, Chair
130 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.5983
irb@lsu.edu | lsu.edu/irb

TO: Timothy Page
Social Work

FROM: Dennis Landin
Chair, Institutional Review Board

DATE: March 2, 2016

RE: IRB# 3420

TITLE: Participation in Active and Passive Music Interventions by Individuals with Alzheimer's Disease and Related Dementias: Effects on Agitation

New Protocol/Modification/Continuation: Continuation

Review type: Full ☐ Expedited ☒ **Review date:** 2/26/2016

Risk Factor: Minimal ☒ Uncertain ☐ Greater Than Minimal ☐

Approved ☒ **Disapproved** ☐

Approval Date: 2/26/2016 **Approval Expiration Date:** 2/25/2017

Re-review frequency: (annual unless otherwise stated)

Number of subjects approved: 32

LSU Proposal Number (if applicable):

Protocol Matches Scope of Work in Grant proposal: (if applicable) ☐

By: Dennis Landin, Chairman 

PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING –
Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. **SPECIAL NOTE: Make sure to use bcc when emailing more than one recipient.**

**All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at <http://www.lsu.edu/irb>*

VITA

Robert J. Prattini, a native of New Orleans, Louisiana, graduated from Louisiana State University with a Bachelor of Science in psychology in 2001. He pursued and received his Master's in cognitive psychology in 2006, also from Louisiana State University. Later he decided to broaden his field of practice and enrolled in the Master of Social Work program at Louisiana State University, in which he graduated from in 2009. In order to continue his interests, he then pursued his Ph.D. in social work, which he plans on receiving in 2016, also from Louisiana State University. He intends to continue his research in an academic setting.